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2.1 Quadratic Functions and Models

1. Find the vertex of the graph of the quadratic function.

$-x^2 + 12x - 36$

a. $(6, 0)$
b. $(-6, 6)$
c. $(-6, 0)$
d. $(0, 6)$
e. $(-6, -6)$

ANSWER: a
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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2. Find the y-intercept(s) of the graph of the quadratic function.

$3x^2 - 30x + 75$

a. $(0, -75)$
b. $(5, 0), (5, 0)$
c. $(0, 5), (0, 5)$
d. $(75, 0)$
e. $(0, 75)$

ANSWER: e
POINTS: 1
QUESTION TYPE: Multiple Choice
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3. For the following demand equation, express the total revenue R as a function of the price p per item.

$q = -2p + 1600$

a. $R = -2p^2 + 1600p$

b. $R = -2p^2 + 1600$

c. $R = 1598p$

d. $R = -2 + \frac{1600}{p}$

e. $R = -2p^2$

ANSWER: a
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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4. For the following demand equation, find the largest possible revenue.

$q = -4p + 6{,}400$

a. 3,200
b. 5,120,000
c. 7,680,000
d. 800
e. 2,560,000

ANSWER: e
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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5. For the following demand equation, find the largest possible revenue.

$q = -4p + 3{,}600$

a. 1,620,000
b. 450
c. 900
d. 810,000
e. 648,000

ANSWER: d
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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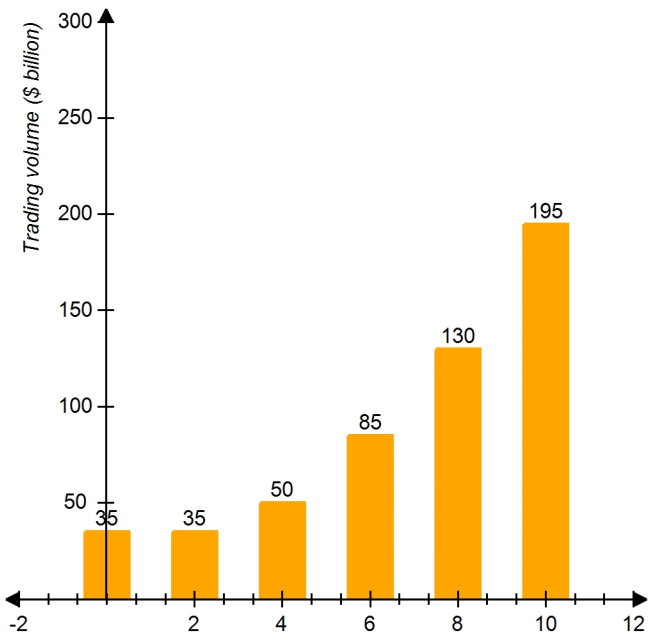
6. The following chart shows the value of trade between two countries for the period 1994 - 2004 ($t = 0$ represents 1994).



Which of the following models best approximates the data given? (Try to answer this without actually computing values.)

a. $f(t) = 2t^2 - 4t - 45$

b. $f(t) = -2t^2 - 4t - 35$

c. $f(t) = -2t^2 + 4t - 45$

d. $f(t) = -2t^2 - 4t + 35$

e. $f(t) = 2t^2 - 4t + 35$

ANSWER: e
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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7. The fuel efficiency (in miles per gallon) of a sport utility vehicle (SUV) depends on its weight according to the formula

$$E = 0.00005x^2 - 0.3x + 41$$

where x is the weight of an SUV in pounds. According to the model, what is the weight of the least fuel-efficient SUV?

a. 3,000 pounds
b. 3,100 pounds
c. 2,000 pounds
d. 6,000 pounds
e. 491 pounds

ANSWER: a
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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8. Suppose the amount of carbon dioxide (in pounds per 15,000 miles) released by a typical sport utility vehicle (SUV) depends on its fuel efficiency according to the formula

$$10x^2 - 580x + 30{,}803$$

where x is a fuel efficiency of an SUV in miles per gallon. According to the model, what is the fuel efficiency of an SUV that has the least carbon dioxide pollution?

a. 14 miles per gallon
b. 19 miles per gallon
c. 18 miles per gallon
d. 32 miles per gallon
e. 29 miles per gallon

ANSWER: e
POINTS: 1
QUESTION TYPE: Multiple Choice
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9. The market research department of the Better Baby Buggy Co. predicts that the demand equation for its buggies is given by $q = -0.5x + 170$ where q is the number of buggies it can sell in a month if the price is \$$x$ per buggy. What is the largest monthly revenue? Round your answer to the nearest dollar.

   a. \$85
   b. \$14,450
   c. \$170
   d. \$7,225
   e. \$28,900

   ANSWER: b
   POINTS: 1
   QUESTION TYPE: Multiple Choice
   HAS VARIABLES: True
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10. The Better Baby Buggy Co. has just come out with a new model, the Turbo. The market research department predicts that the demand equation for Turbos is given by $q = -4x + 220$ where q is the number of buggies it can sell in one month if the price is \$$x$ per buggy. At what price should it sell the buggies to get the largest revenue? Round the result to the nearest dollar.

    a. \$14
    b. \$110
    c. \$28
    d. \$128
    e. \$3,025

    ANSWER: c
    POINTS: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: True
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11. Pack-Em-In Real Estate is building a new housing development. The more houses it builds, the less people will be willing to pay, due to the crowding and smaller lot sizes. In fact, if the company builds 60 houses in this particular development, it can sell them for $160,000 each, but if it builds 70 houses, it will be able to get only $150,000 each. What is the largest possible revenue the company can get? Round your answer to the nearest dollar.

    a. $11,000,000
    b. $11,856,000
    c. $363,000
    d. $12,100,000
    e. $12,226,000

    ANSWER: d
    POINTS: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: True
    DATE CREATED: 2/10/2016 3:41 PM
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12. Encouraged by the popularity of your Dungeons and Dragons website, www.mudbeast.net, you have decided to charge users who log on to the site. When you charged a $1.50 access fee, your web counter showed a demand of 270 "hits" per month. After you lowered the price to $0.50, activity increased to 350 "hits" per month. Obtain the monthly revenue R as a function of the access fee x.

    a. $R = -80x^2 - 390x$
    b. $R = 80x^2 - 230x$
    c. $R = -80x^2 + 390x$
    d. $R = -80x + 390$
    e. $R = 80x - 230$

    ANSWER: c
    POINTS: 1
    QUESTION TYPE: Multiple Choice
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13. The two fraternities Sigma Alpha Mu and Ep Sig plan to raise money jointly to benefit homeless people on Long Island. They will sell Starship Troopers T-shirts in the Student Center, but they are not sure how much to charge. Sigma Alpha Mu treasurer Solo recalls that they once sold 100 shirts in a week at $4 each, but Ep Sig treasurer Justino claims that, based on past experience, they can sell 400 per week if they charge $2 each. The university administration charges the fraternities $700 per week for use of the Student Center. What is the largest possible weekly profit, rounded to the nearest dollar?

    a. $700
    b. $117
    c. $817
    d. $233
    e. $1,633

    ANSWER: b
    POINTS: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: True
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14. You have just opened a new nightclub, Russ's Techno Pitstop, but you are unsure how much to charge for the cover charge (entrance fee). One week you charged $9 cover per guest and averaged 372 guests per night. The next week you charged $20 per guest and averaged 240 guests per night. Find the linear demand equation showing the number of guests q per night as a function of the cover charge p.

    a. $q = -12p + 480$
    b. $q = 12p + 480$
    c. $q = -12p + 492$
    d. $q = -12p + 468$
    e. $q = 12p + 492$

    ANSWER: a
    POINTS: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: True
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15. You are the sales manager for Montevideo Productions, Inc., and you are planning to review the prices you charge clients for television advertisement development. You currently charge each client an hourly development fee of $2,500. With this pricing structure, the demand, measured by the number of contracts Montevideo signs per month, is 35 contracts. This is down 10 contracts from the figure last year, when your company charged only $2,000. Construct a linear demand equation giving the number of contracts q as a function of the hourly fee p Montevideo Productions, Inc., charges for development.

a. $q = -50p - 85$

b. $q = -0.02p - 85$

c. $q = -0.02p + 85$

d. $q = 50p + 85$

e. $q = 0.02p + 85$

ANSWER: c
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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16. For the following demand equation, find the largest possible revenue.

$q = -6p + 3{,}600$

$ _____

ANSWER: 540,000
POINTS: 1
QUESTION TYPE: Numeric Response
HAS VARIABLES: True
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17. Pack-Em-In Real Estate is building a new housing development. The more houses it builds, the less people will be willing to pay, due to the crowding and smaller lot sizes. In fact, if the company builds 60 houses in this particular development, it can sell them for $190,000 each, but if it builds 70 houses, it will be able to get only $170,000 each. What is the largest possible revenue the company can get?

$ _____

ANSWER: 12,012,500
POINTS: 1
QUESTION TYPE: Numeric Response
HAS VARIABLES: True
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Choose the correct letter for each question.

a. $x^2 - 6x + 8$

b. $x^2 + 10x + 25$

c. $x^2 + 10x + 30$

QUESTION TYPE: Matching
HAS VARIABLES: True
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18. –5

ANSWER: b
POINTS: 1

19. 2, 4

ANSWER: a
POINTS: 1

20. none

ANSWER: c
POINTS: 1

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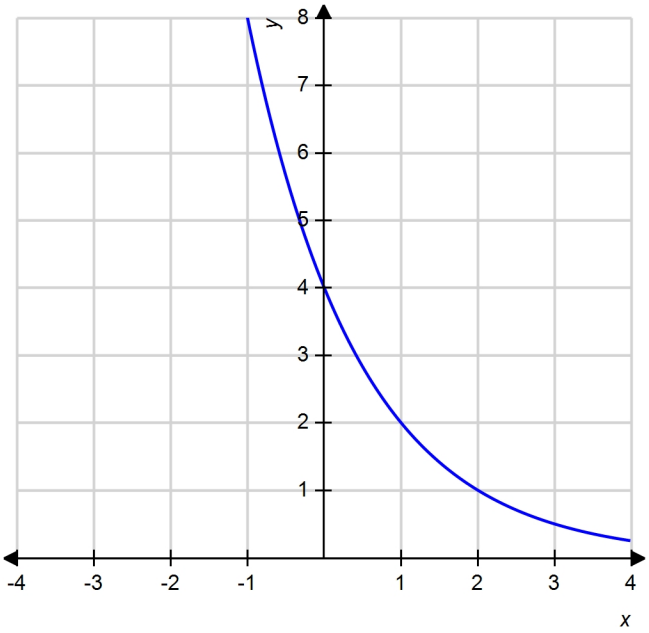
2.2 Exponential Functions and Models

1. Graph the function.

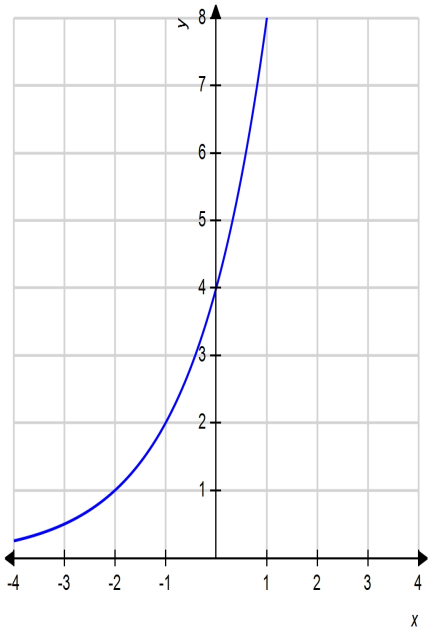
$$f(x) = 4\left(2^{-x}\right)$$

Select the correct answer.

a.



b.



c.

d.

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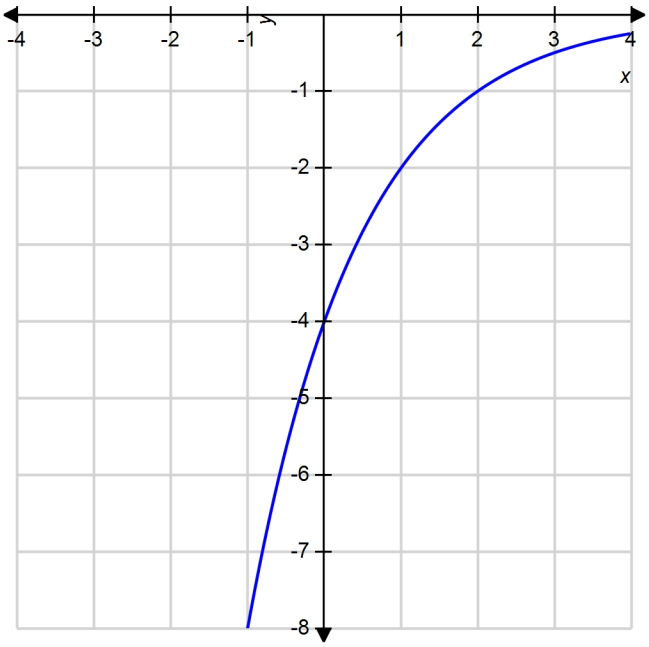

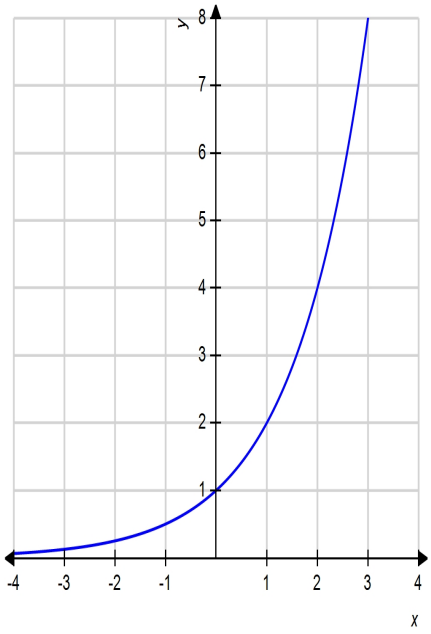

ANSWER: a
POINTS: 1
QUESTION TYPE: Multiple Choice
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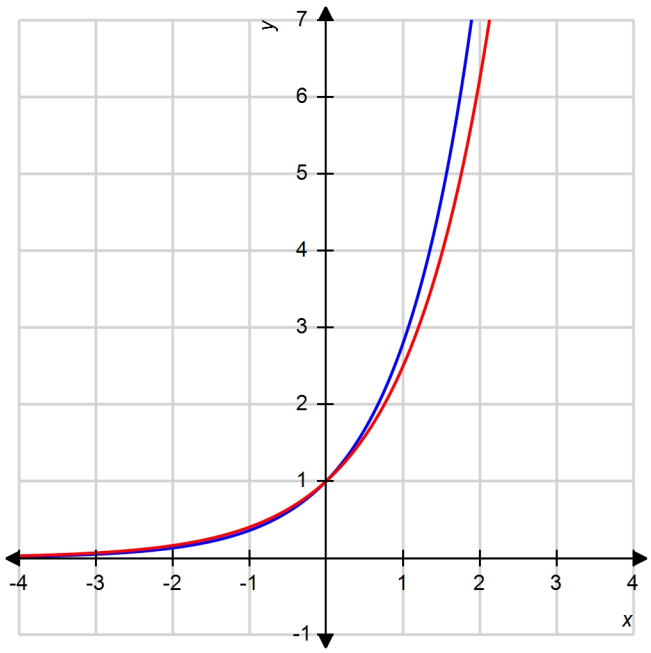
2.2 Exponential Functions and Models

2. Given the graph of the functions $f_1(x) = 2.5^x$ and $f_2(x) = 2.8^x$. Identify which graph corresponds to $f_2(x) = 2.8^x$.



Select the correct answer.

a. Blue
b. Red

ANSWER: a
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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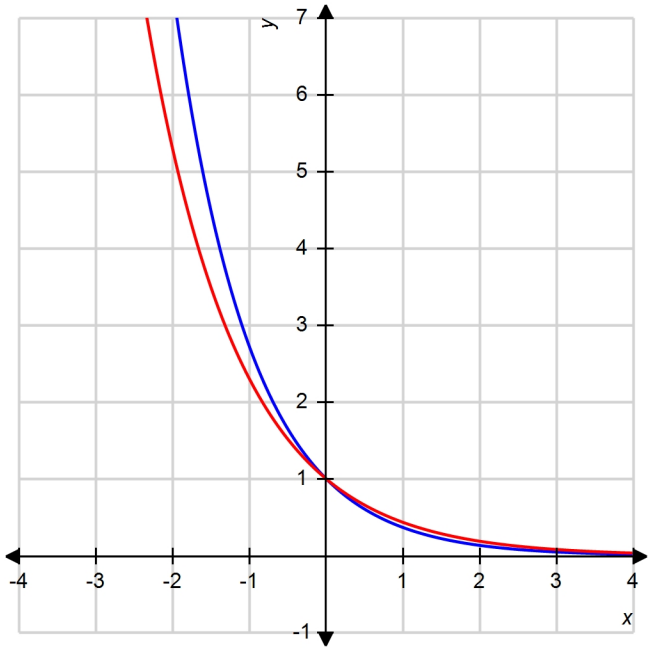
3. Given the graph of the functions $f_1(x) = 2.3^{-x}$ and $f_2(x) = e^{-x}$. Determine the color of the graph that corresponds to $f_1(x)$.



Select the correct answer.

a. Blue
b. Red

ANSWER: b
POINTS: 1
QUESTION TYPE: Multiple Choice
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2.2 Exponential Functions and Models

4. Model the data using an exponential function $f(x) = Ab^x$.

x	0	1	2
$f(x)$	40	80	160

Select the correct answer.

a. $f(x) = 40(2)^x$

b. $f(x) = 40(2)^{-x}$

c. $f(x) = 2(40)^{-x}$

d. $f(x) = 2(2)^x$

e. $f(x) = 40(40)^x$

ANSWER: a
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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5. Model the data using an exponential function $f(x) = Ab^x$.

x	0	1	2
$f(x)$	350	175	87.5

Select the correct answer.

a. $f(x) = 0.5(0.5)^x$

b. $f(x) = 350(350)^x$

c. $f(x) = 350(0.5)^x$

d. $f(x) = 350(0.5)^{-x}$

e. $f(x) = 0.5(350)^{-x}$

ANSWER: c
POINTS: 1
QUESTION TYPE: Multiple Choice
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2.2 Exponential Functions and Models

6. Model the data using an exponential function $f(x) = Ab^x$.

x	1	2
$f(x)$	13	16.9

Select the correct answer.

a. $f(x) = 10(10)^x$

b. $f(x) = 1.3(1.3)^{-x}$

c. $f(x) = 10(1.3)^x$

d. $f(x) = 10(1.3)^{-x}$

e. $f(x) = 1.3(10)^x$

ANSWER: c
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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7. Find an equation for an exponential function that passes through the pair of points $(4, 3)$ and $(7, 1)$.

$y = Ab^x \ (b > 0)$

a. $A = 12.9805$, $b = 0.693$

b. $A = 12.9799$, $b = 0.6935$

c. $A = 12.9792$, $b = 0.6924$

d. $A = 13.0162$, $b = 0.5584$

e. $A = 12.9802$, $b = 0.6934$

ANSWER: e
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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8. Soon after taking an aspirin, a patient has absorbed 310 mg of the drug. If the amount of aspirin in the bloodstream decays exponentially with half being removed every 2 hours, find the amount of aspirin in the bloodstream after 9 hours.

   Select the correct answer.

   a. 1,370
   b. 137
   c. 50
   d. 13.7
   e. 2.21

   ANSWER: d
   POINTS: 1
   QUESTION TYPE: Multiple Choice
   HAS VARIABLES: True
   DATE CREATED: 2/10/2016 3:41 PM
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9. The U.S. population was 170 million in 1950 and 240 million in 1990. Assuming exponential population growth, what will the population be in the year 2020? Round your answer to the nearest million.

   Select the correct answer.

   a. 250 million
   b. 243 million
   c. 486 million
   d. 972 million
   e. 311 million

   ANSWER: e
   POINTS: 1
   QUESTION TYPE: Multiple Choice
   HAS VARIABLES: True
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10. Rock Solid Bank & Trust is offering a CD that pays 5% compounded continuously. How much interest would a $1,000 deposit earn over 12 years? (Round your answer to the nearest dollar.)

    Select the correct answer.

    a. $2,822
    b. $822
    c. $1,822
    d. $1,820
    e. $1,796

    ANSWER: b
    POINTS: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: True
    DATE CREATED: 2/10/2016 3:41 PM
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11. Which of the following five functions will be largest for large values of x?

    Select the correct answer.

    a. $h(x) = x^{10}$
    b. $f(x) = 64x^8$
    c. $f(x) = x^8$
    d. $g(x) = 8^x$
    e. $f(x) = 8x^8$

    ANSWER: d
    POINTS: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: True
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12. Which of the following five functions will be smallest for large values of x?

    Select the correct answer.

    a. $f(x) = x^{-36}$

    b. $f(x) = x^{-216}$

    c. $g(x) = 6^{-x}$

    d. $f(x) = x^{-6}$

    e. $h(x) = x^{-100}$

    ANSWER: c
    POINTS: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: True
    DATE CREATED: 2/10/2016 3:41 PM
    DATE MODIFIED: 5/17/2016 1:17 PM

13. The U.S. population was 170 million in 1970 and 250 million in 1995. Assuming exponential population growth, what will the population be in the year 2025?

    Round your answer to the nearest million.

    _____ million

    ANSWER: 397
    POINTS: 1
    QUESTION TYPE: Numeric Response
    HAS VARIABLES: True
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14. Model the data using an exponential function $f(x) = Ab^x$.

x	0	1	2
$f(x)$	300	75	18.75

    ANSWER: $f(x) = 300 \cdot (0.25)^x$
    POINTS: 1
    QUESTION TYPE: Subjective Short Answer
    HAS VARIABLES: True
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15. Model the data using an exponential function $f(x) = Ab^x$.

x	0	1	2
$f(x)$	10	20	40

ANSWER: $f(x) = 10 \cdot 2^x$

POINTS: 1
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: True
DATE CREATED: 2/10/2016 3:41 PM
DATE MODIFIED: 5/17/2016 1:18 PM

16. Model the data using an exponential function $f(x) = Ab^x$.

x	1	2
$f(x)$	170	289

ANSWER: $f(x) = 100 \cdot 1.7^x$

POINTS: 1
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: True
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DATE MODIFIED: 5/17/2016 1:19 PM

17. Find the equation for the exponential function that passes through the pair of points $(2, 4)$ and $(7, 1)$.

$y = Ab^x \ (b > 0)$

$A =$ _____

$b =$ _____

Round your answer to four decimal places.

ANSWER: 6.9644; 0.7579
POINTS: 1
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: True
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18. True or False?

The given table corresponds to the function $f(x) = 10^x$.

x	-3	-2	-1	0	1	2	3
$f(x)$	0.001	0.01	0.1	1	10	100	1,000

a. True

b. False

ANSWER: True
POINTS: 1
QUESTION TYPE: True / False
HAS VARIABLES: False
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DATE MODIFIED: 5/17/2016 1:22 PM

19. True or False?

The given table corresponds to the function $f(x) = 10^{-x}$.

x	-3	-2	-1	0	1	2	3
$f(x)$	0.001	0.01	0.1	1	10	100	1,000

a. True

b. False

ANSWER: False
POINTS: 1
QUESTION TYPE: True / False
HAS VARIABLES: False
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20. True or False?

The given table corresponds to the function $f(x) = 5^x - 1$.

x	-3	-2	-1	0	1	2	3
$f(x)$	-0.992	-0.96	-0.8	0	4	24	124

a. True

b. False

ANSWER: True
POINTS: 1
QUESTION TYPE: True / False
HAS VARIABLES: False
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21. True or False?

The given table corresponds to the function $f(x) = 10^{x-1}$.

x	-3	-2	-1	0	1	2	3
$f(x)$	0.0001	0.001	0.01	0.1	1	10	100

a. True

b. False

ANSWER: True
POINTS: 1
QUESTION TYPE: True / False
HAS VARIABLES: False
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22. True or False?

The given table corresponds to the function $f(x) = e^{\frac{x}{5}}$.

x	-3	-2	-1	0	1	2	3
$f(x)$	0.549	0.67	0.819	1	1.221	1.492	1.822

a. True

b. False

ANSWER: True
POINTS: 1
QUESTION TYPE: True / False
HAS VARIABLES: False
DATE CREATED: 2/10/2016 3:41 PM
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23. True or False?

The given table corresponds to the function $f(x) = 0.042\left(4.2 - \frac{5}{1.7}\right)^{-x}$.

x	-3	-2	-1	0	1	2	3
$f(x)$	0.084	0.067	0.067	1	0.033	0.027	0.021

a. True

b. False

ANSWER: False
POINTS: 1
QUESTION TYPE: True / False
HAS VARIABLES: False
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2.3 Logarithmic Functions and Models

1. Use logarithms to solve the equation. Round your answer to four decimal places.

$6^{-2x} = 40$

a. $x = -0.8333$
b. $x = -1.8493$
c. $x = 0.8333$
d. $x = 1.0294$
e. $x = -1.0294$

ANSWER: e
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
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2. Use logarithms to solve the equation. Round your answer to four decimal places.

$8\left(2.5^{2x-1}\right) = 10$

a. $x = 1.2436$
b. $x = 0.6218$
c. $x = 0.25$
d. $x = -0.6218$
e. $x = -1.2436$

ANSWER: b
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
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3. Graph the function.

$f(x) = \log_5 x$

a. b.

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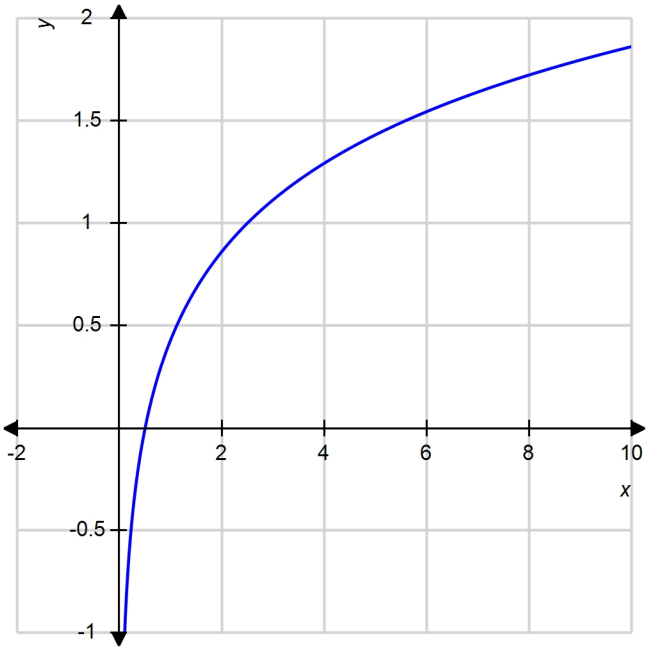
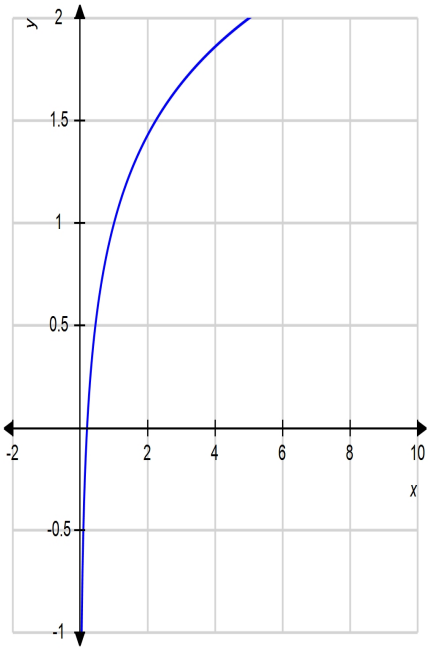


c.



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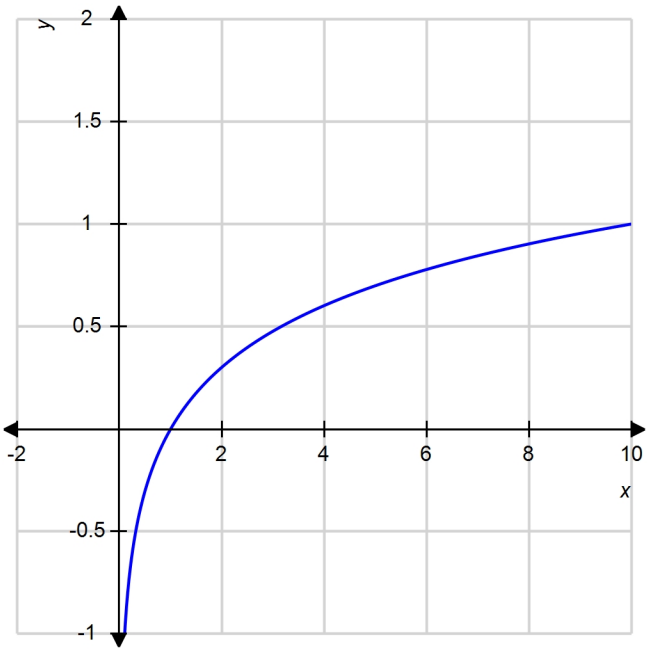
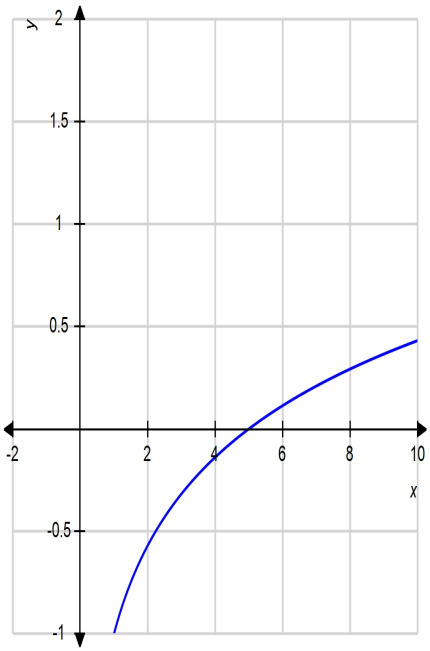


e.



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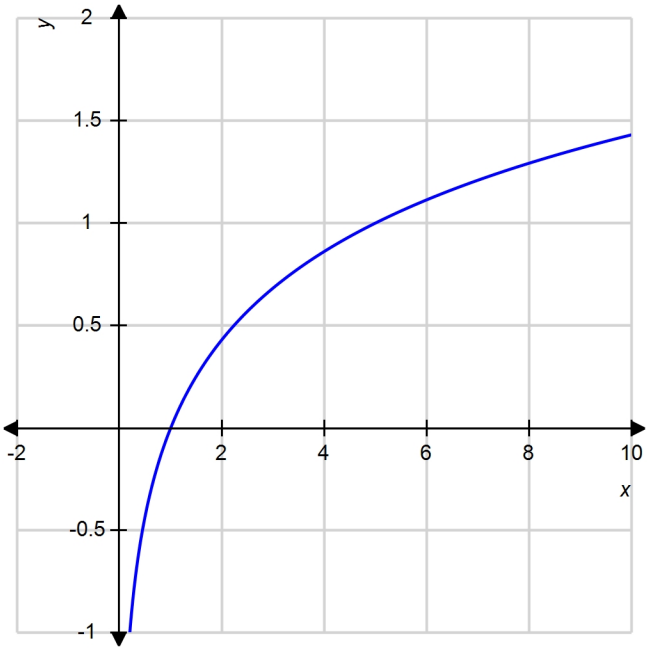

ANSWER: e
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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4. Graph the function.

$$f(x) = \log_{\frac{1}{6}} x$$

a.

b.

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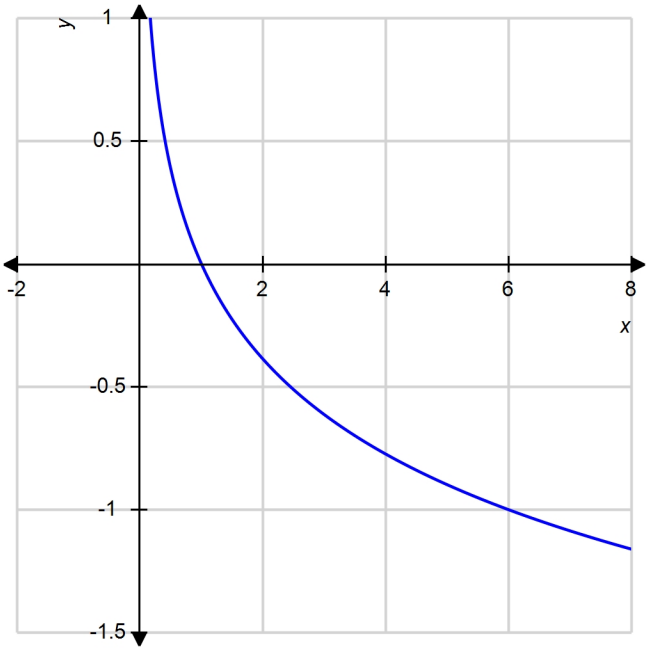

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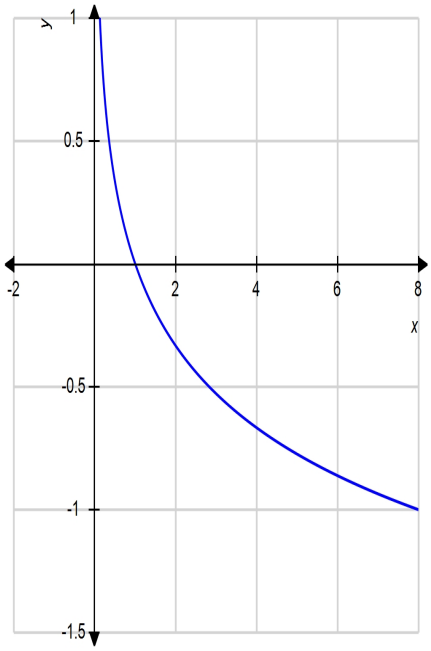

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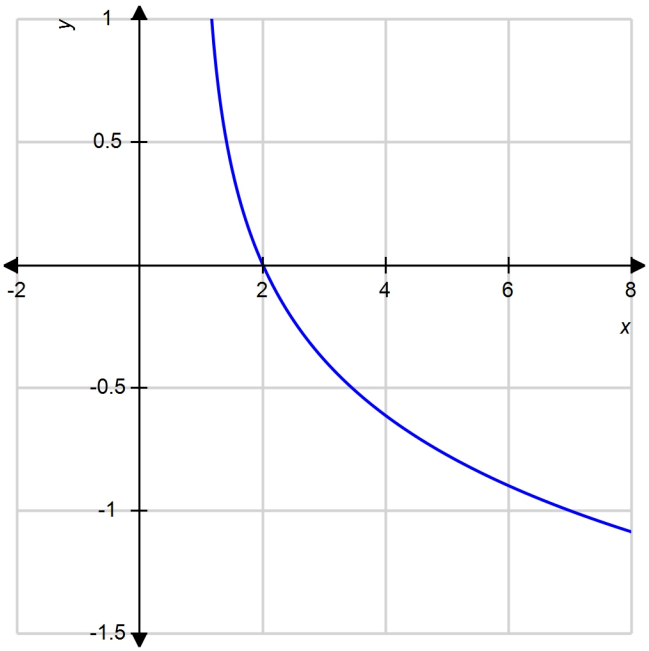

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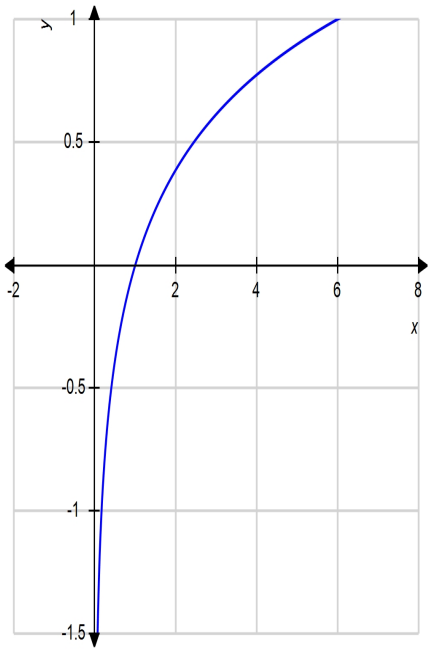

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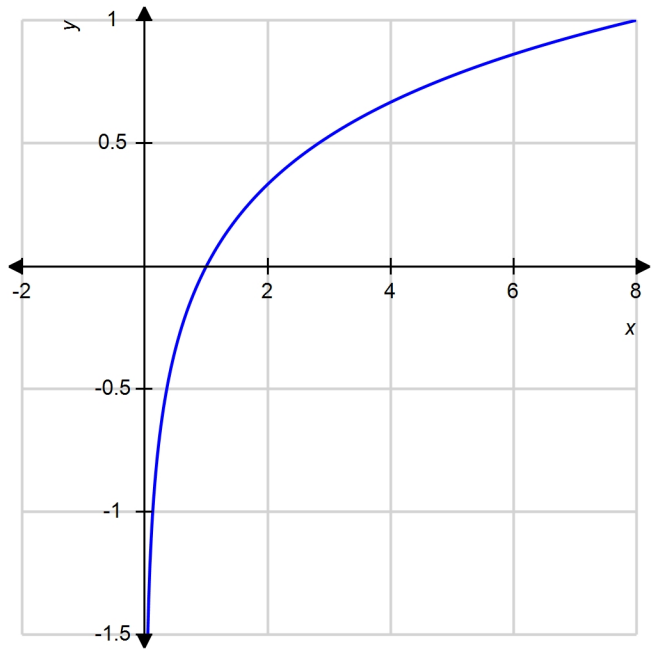

ANSWER: a
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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5. Find the associated exponential decay model.

$Q = 7{,}000$ when $t = 0$; Half-life = 9

a. $Q = 7{,}000 - e^{-\frac{t}{9}}$

b. $Q = 7{,}000e^{-\frac{t(\ln 2)}{9}}$

c. $Q = 7{,}000 + e^{\frac{t(\ln 2)}{9}}$

d. $Q = 7{,}000e^{-\frac{t}{9}}$

e. $Q = 7{,}000e^{\frac{t}{9}}$

ANSWER:	b
POINTS:	1
QUESTION TYPE:	Multiple Choice
HAS VARIABLES:	True
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6. Find the associated doubling time.

$Q = 1{,}000e^{0.5t}$

a. $\frac{2}{\ln 2}$

b. $0.5\ln 2$

c. $\ln 2$

d. $\frac{0.5}{\ln 2}$

e. $2\ln 2$

ANSWER: e
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
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7. Convert the exponential function to the form indicated. Round all coefficients to four significant digits.

$f(x) = 2.7e^{-0.7x}$; $f(x) = Ab^x$

a. $A = 3.7$, $b = 0.62$

b. $A = 2.7$, $b = 0.4966$

c. $A = 3.7$, $b = 0.4946$

d. $A = 4.7$, $b = 0.3621$

e. $A = 2.7$, $b = 0.4969$

ANSWER: b
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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2.3 Logarithmic Functions and Models

8. Convert the exponential function to the form indicated. Round all coefficients to four significant digits.

$f(t) = 23.2(0.997)^t$; $f(t) = Q_0 e^{-k \cdot t}$

a. $Q_0 = 23.2$, $k = 0.004754$
b. $Q_0 = 23.2$, $k = 0.003005$
c. $Q_0 = 23.2$, $k = 0.001256$
d. $Q_0 = 23.1$, $k = 0.008252$
e. $Q_0 = 23.1$, $k = 0.006503$

ANSWER: b
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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9. How long will it take an investment to triple if it is continuously compounded at 15% per year?

Select the correct answer rounded to the nearest year.

a. 15 years
b. 13 years
c. 8 years
d. 4 years
e. 7 years

ANSWER: e
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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2.3 Logarithmic Functions and Models

10. The amount of carbon-14 remaining in a sample that weighs B is given by $X(t) = B(0.999879)^t$ where t is time in years. If tests on a fossilized skull reveal that 99.92% of the carbon-14 has decayed, how old is the skull?

    Select the correct answer rounded to the nearest integer.

    a. 58,929 years old
    b. 2,629 years old
    c. 1,985 years old
    d. 0 years old
    e. 23,234 years old

    ANSWER: a
    POINTS: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: True
    DATE CREATED: 2/10/2016 3:42 PM
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11. The table lists interest rates on long-term investments (based on 10-year government bonds) in several countries in 2004-2005. Assuming that you invest $13,000 in Japan, how long (to the nearest year) must you wait before your investment is worth $19,000 if the interest is compounded annually? Round your answer to the nearest year.

Country	U.S.	Japan	Canada
Yield	5.3%	1.5%	5.2%

    a. 26 years
    b. 19 years
    c. 25 years
    d. 22 years
    e. 28 years

    ANSWER: c
    POINTS: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: True
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12. How long, to the nearest year, will it take an investment in U.S. to double its value if the interest is compounded every six months? Please round the answer to the nearest year.

Country	U.S.	Japan	Canada	Korea	Australia
Yield	5.3%	1.5%	5.2%	5.4%	6.0%

a. 14 years
b. 16 years
c. 13 years
d. 8 years
e. 15 years

ANSWER: c
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
DATE CREATED: 2/10/2016 3:42 PM
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13. Plutonium-239 is used as a fuel for some nuclear reactors and also as the fissionable material in atomic bombs. It has a half-life of 24,400 years. How long will it take 12 grams of plutonium-239 to decay to 2 grams?

Round your answer to the nearest hundreds.

a. 31,600 years
b. 15,800 years
c. 126,200 years
d. 63,100 years
e. 63,200 years

ANSWER: d
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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14. Soon after taking an aspirin, a patient has absorbed 350 mg of the drug. If the amount of aspirin in the bloodstream decays exponentially, with half being removed every 2 hours, find the time it will take for the amount of aspirin in the bloodstream to decrease to 260 mg.

    Select the answer rounded to three decimal places.

    a. 1.715 hours
    b. 0.858 hours
    c. 0.429 hours
    d. 2.573 hours
    e. 2.144 hours

    ANSWER: b
    POINTS: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: True
    DATE CREATED: 2/10/2016 3:42 PM
    DATE MODIFIED: 5/19/2016 8:26 AM

15. You are trying to determine the half-life of a new radioactive element you have isolated. You start with 2 grams, and 4 days later you determine that it has decayed down to 0.1 gram. What is the half-life? Round your answer to three decimal places.

    Select the answer rounded to three decimal places.

    a. 1.388 days
    b. 1.851 days
    c. 2.777 days
    d. 0.463 days
    e. 0.926 days

    ANSWER: e
    POINTS: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: True
    DATE CREATED: 2/10/2016 3:42 PM
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16. Use logarithms to solve the equation. (Round the answer to four decimal places.)

$$6\left(6.5^{3x-2}\right) = 10$$

x = _____

ANSWER: 0.7576
POINTS: 1
QUESTION TYPE: Numeric Response
HAS VARIABLES: False
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17. How long, to the nearest year, will it take an investment to triple if it is continuously compounded at 15% per year?

Round the answer to the nearest year.

_____ years

ANSWER: 7
POINTS: 1
QUESTION TYPE: Numeric Response
HAS VARIABLES: True
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18. The table lists interest rates on long-term investments (based on 10-year government bonds) in several countries in 2004-2005. Assuming that you invest $12,000 in Japan, how long (to the nearest year) must you wait before your investment is worth $18,000 if the interest is compounded annually?

Country	U.S.	Japan	Canada
Yield	5.3%	1.5%	5.2%

_____ year(s)

ANSWER: 27
POINTS: 1
QUESTION TYPE: Numeric Response
HAS VARIABLES: True
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19. How long, to the nearest year, will it take an investment in Canada to double its value if the interest is compounded every six months? Please round the answer to the nearest year.

Country	U.S.	Japan	Canada	Korea	Australia
Yield	5.3%	1.5%	5.2%	5.4%	6.0%

$t =$ _____ year(s)

ANSWER: 14
POINTS: 1
QUESTION TYPE: Numeric Response
HAS VARIABLES: True
DATE CREATED: 2/10/2016 3:42 PM
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20. Plutonium-239 is used as a fuel for some nuclear reactors and also as the fissionable material in atomic bombs. It has a half-life of 24,400 years. How long will it take 40 grams of plutonium-239 to decay to 3 grams?

Round your answer to the nearest hundreds.

_____ years

ANSWER: 91,200
POINTS: 1
QUESTION TYPE: Numeric Response
HAS VARIABLES: True
DATE CREATED: 2/10/2016 3:42 PM
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21. Find the associated exponential decay model.

$Q = 6{,}000$ when $t = 0$; Half-life = 5

ANSWER: $Q = 6{,}000e^{\frac{-t \cdot \ln 2}{5}}$

POINTS: 1
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: True
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22. Convert the exponential function to the form indicated. Round all coefficients to four significant digits.

$f(t) = 23.7(0.996)^t$; $f(t) = Q_0 e^{-k \cdot t}$

$Q_0 =$ _____

$k =$ _____

ANSWER: 23.7; 0.004008
POINTS: 1
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: True
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23. True or False?

The table below is filled correctly.

Exponential form	Logarithmic form
$5^1 = 5$	$\log_5 5 = 1$
$7^4 = 2{,}401$	$\log_7 2{,}401 = 4$
$9^{-1} = \frac{1}{9}$	$\log_9 \frac{1}{9} = -1$
$10^3 = 1{,}000$	$\log_{10} 1{,}000 = 3$

a. True
b. False

ANSWER: True
POINTS: 1
QUESTION TYPE: True / False
HAS VARIABLES: False
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DATE MODIFIED: 10/18/2016 2:21 AM

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24. True or False?

The table is filled correctly.

Exponential form	Logarithmic form
$8^{-3} = 0.001953$	$\log_8 0.001953 = 3$
$2^0 = 1$	$\log_2 1 = 0$
$0.4^4 = 0.0256$	$\log_{0.4} 0.0256 = 4$
$0.8^{-3} = 1.953125$	$\log_{0.8} 1.953125 = 3$

a. True

b. False

ANSWER: False
POINTS: 1
QUESTION TYPE: True / False
HAS VARIABLES: False
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25. True or False?

The table below is filled correctly.

Exponential form	Logarithmic form
$5^4 = 625$	$\log_5 625 = 4$
$0.6^2 = 0.36$	$\log_{0.6} 0.36 = 2$
$7^0 = 1$	$\log_7 1 = 0$
$8^{-1} = 0.125$	$\log_8 0.125 = -1$

a. True

b. False

ANSWER: True
POINTS: 1
QUESTION TYPE: True / False
HAS VARIABLES: False
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2.4 Logistic Functions and Models

1. Find N, A, and b for the function.

$$f(x) = \frac{11}{1 + 2\left(0.2^{-x}\right)}$$

a. $N = 2$, $A = 0.2$, $b = 11$

b. $N = 2$, $A = 11$, $b = 0.2$

c. $N = 11$, $A = 2$, $b = 0.2$

d. $N = 11$, $A = 0.2$, $b = 2$

e. $N = 0.2$, $A = 2$, $b = 11$

ANSWER: c
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
DATE CREATED: 2/10/2016 3:42 PM
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2. Find N, A, and b for the function given.

$$f(x) = \frac{2}{0.5 + 2.5\left(1.5^{-x}\right)}$$

a. $N = 5$, $A = 1.5$, $b = 4$

b. $N = 5$, $A = 4$, $b = 1.5$

c. $N = 1.5$, $A = 5$, $b = 4$

d. $N = 4$, $A = 5$, $b = 1.5$

e. $N = 4$, $A = 1.5$, $b = 5$

ANSWER: d
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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2.4 Logistic Functions and Models

3. Find the logistic function f with the given properties. $f(0) = 20$, f has limiting value 500, and for small values of x, f is approximately exponential and doubles with every increase of 1 in x.

a. $f(x) = \dfrac{500}{1 + 24\left(2^{-x}\right)}$

b. $f(x) = \dfrac{500}{1 + 24\left(1.5^{-x}\right)}$

c. $f(x) = \dfrac{500}{1 + 1.5^{-x}}$

d. $f(x) = \dfrac{1}{1 + 24\left(2^{-x}\right)}$

e. $f(x) = \dfrac{500}{1 + 2^{-x}}$

ANSWER: a
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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4. Find the logistic function f with the given properties. $f(0) = 1$, f has limiting value 20, and for small values of x, f is approximately exponential and grows by 50% with every increase of 1 in x.

a. $f(x) = \dfrac{1}{1 + 1.5^{-x}}$

b. $f(x) = \dfrac{20}{1 + 19\left(1.5^{-x}\right)}$

c. $f(x) = \dfrac{20}{1 + 2^{-x}}$

d. $f(x) = \dfrac{20}{1 + 19\left(2^{-x}\right)}$

e. $f(x) = \dfrac{20}{1 + 1.5^{x}}$

ANSWER: b
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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2.4 Logistic Functions and Models

5. Find the logistic function f with the given properties. f has limiting value 18 and passes through (0, 9) and (1, 16).

a. $f(x) = \dfrac{1}{1+2\left(8^{-x}\right)}$

b. $f(x) = \dfrac{18}{1+2\left(16^{-x}\right)}$

c. $f(x) = \dfrac{18}{1+\left(8^{-x}\right)}$

d. $f(x) = \dfrac{9}{1+\left(8^{-x}\right)}$

e. $f(x) = \dfrac{18}{1+\left(16^{-x}\right)}$

ANSWER: c
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
DATE CREATED: 2/10/2016 3:42 PM
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6. Find the logistic function f with the given properties. f has limiting value 12 and passes through (0, 3) and (1, 10).

a. $f(x) = \dfrac{12}{1+4\left(30^{-x}\right)}$

b. $f(x) = \dfrac{12}{1+3\left(15^{-x}\right)}$

c. $f(x) = \dfrac{3}{1+3\left(30^{-x}\right)}$

d. $f(x) = \dfrac{3}{1+3\left(15^{-x}\right)}$

e. $f(x) = \dfrac{12}{1+3\left(30^{-x}\right)}$

ANSWER: b
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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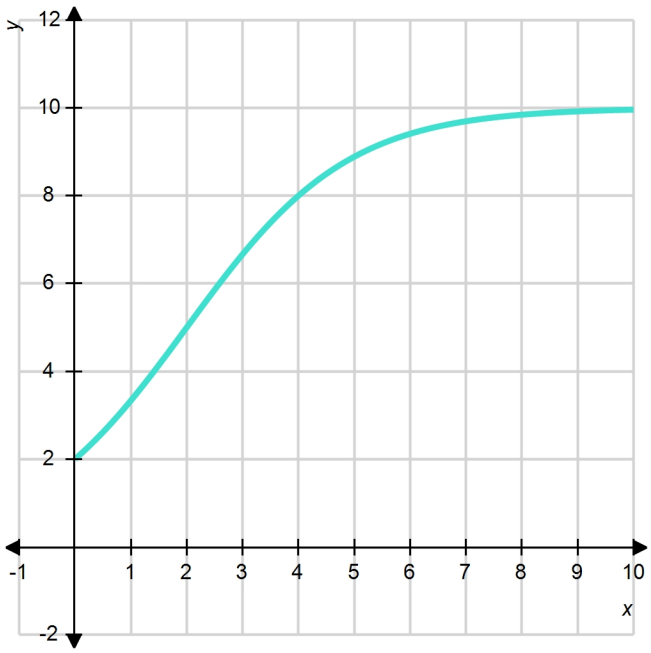
2.4 Logistic Functions and Models

7. Choose the logistic function that best approximates the given curve.



a. $f(x) = \dfrac{10}{1 + 0.5\left(1.01^{-x}\right)}$

b. $f(x) = \dfrac{10}{1 + 4\left(2^{-x}\right)}$

c. $f(x) = \dfrac{6}{1 + 4\left(3^{-x}\right)}$

d. $f(x) = \dfrac{6}{1 + 0.5\left(2^{-x}\right)}$

e. $f(x) = \dfrac{6}{1 + 0.5\left(3^{-x}\right)}$

ANSWER: b
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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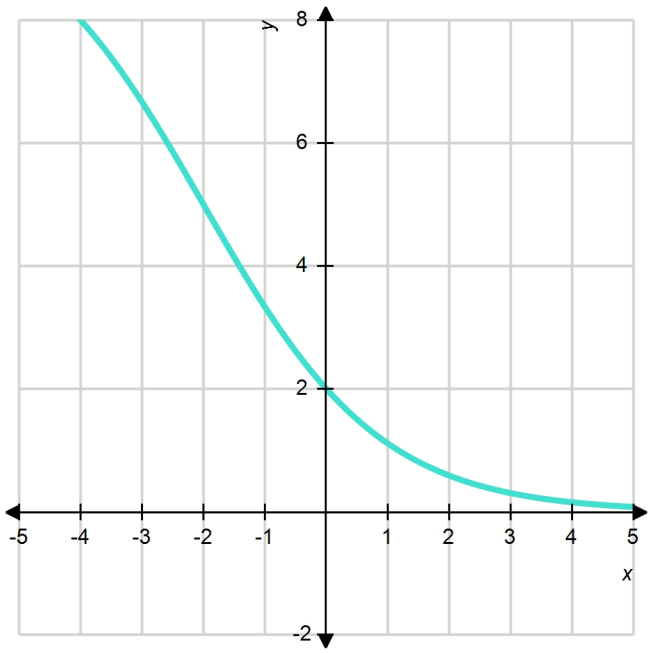
8. Choose the logistic function that best approximates the given curve.



a. $f(x) = \dfrac{10}{1+9\left(5^{-x}\right)}$

b. $f(x) = \dfrac{10}{1+4\left(5^{-x}\right)}$

c. $f(x) = \dfrac{10}{1+4\left(0.5^{-x}\right)}$

d. $f(x) = \dfrac{10}{1+6\left(0.5^{-x}\right)}$

e. $f(x) = \dfrac{10}{1+9\left(0.5^{-x}\right)}$

ANSWER: c
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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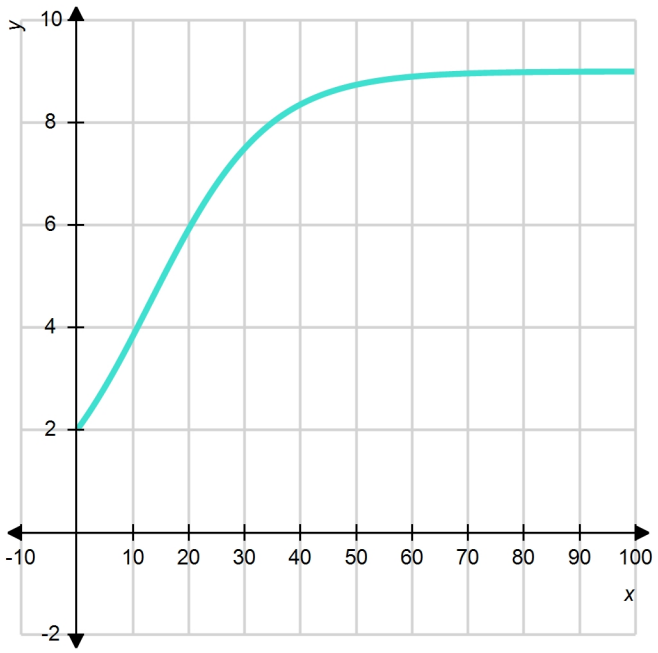
9. Choose the logistic function that best approximates the curve.



a. $f(x) = \dfrac{18}{1 + 2(1.1)^{-x}}$

b. $f(x) = \dfrac{18}{2 + 2(4)^{-x}}$

c. $f(x) = \dfrac{18}{2 + 7(1.1)^{-x}}$

d. $f(x) = \dfrac{18}{1 + 7(1.1)^{-x}}$

e. $f(x) = \dfrac{18}{2 + 7(4)^{-x}}$

ANSWER: c
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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10. Use technology to find a logistic regression curve $y = \dfrac{N}{1 + Ab^{-x}}$ approximating the given data. (Round b to three significant digits and A and N to two significant digits.)

x	0	20	40	60	80	100
y	2.2	3.8	5.0	6.1	6.8	6.9

a. $y = \dfrac{7.2}{1 + 2.2\left(1.04^{-x}\right)}$

b. $y = \dfrac{7.2}{4.4\left(1.04^{-x}\right)}$

c. $y = \dfrac{5.2}{1 + 2.2\left(1.04^{-x}\right)}$

d. $y = \dfrac{5.2}{1 + 4.4\left(2.08^{-x}\right)}$

e. $y = \dfrac{7.2}{1 + 2.2\left(2.08^{-x}\right)}$

ANSWER: a
POINTS: 1
QUESTION TYPE: Multiple Choice
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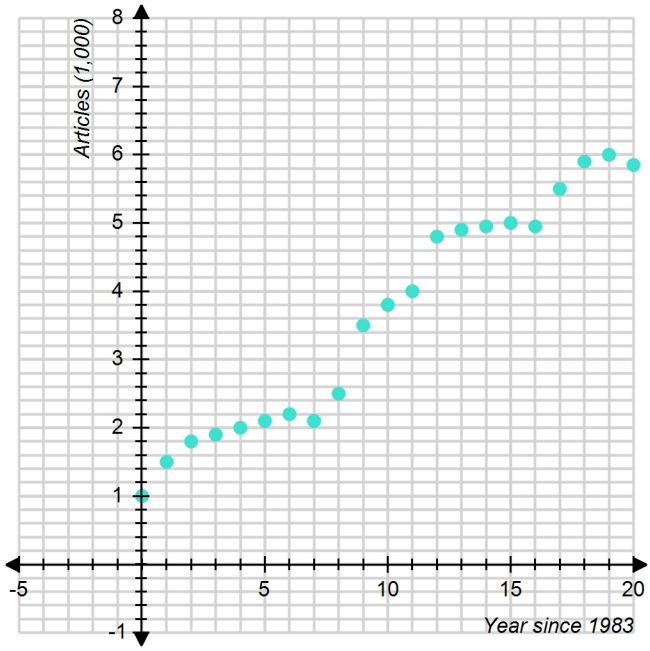
2.4 Logistic Functions and Models

11. The chart shows the number of research articles in the prominent journal *Physics Review* that were written by researchers in Europe during 1983 - 2003 ($t = 0$ represents 1983).



Which of the following logistic functions best models the data? (t is the number of years since 1983.) Try to determine the correct model without actually computing data points.

a. $A(t) = \dfrac{5.1}{1 + 4.5(1.2)^{-t}}$

b. $A(t) = \dfrac{4.5}{1 + 4.2(1.2)^{-t}}$

c. $A(t) = \dfrac{7.0}{1 + 5.4(1.2)^{-t}}$

d. $A(t) = \dfrac{7.0}{1 + 5.4(0.7)^{-t}}$

e. $A(t) = \dfrac{4.5}{1 + 4.2(0.7)^{-t}}$

ANSWER: c
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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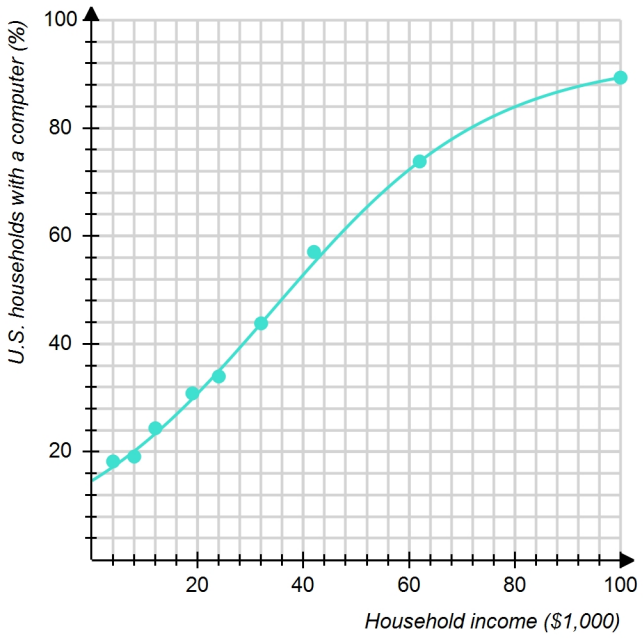
2.4 Logistic Functions and Models

12. The graph shows the actual percentage of U.S. households with a computer as a function of household income (the data points) and a logistic model of these data (the curve). The logistic model is

$$P(x) = \frac{93}{1 + 5.35(1.05)^{-x}}$$

where x is the household income in thousands of dollars. According to the model, what percentage of extremely wealthy households had computers?



a. $P(x)$ is close to $N = 94\%$.

b. $P(x)$ is close to $N = 100\%$.

c. $P(x)$ is close to $N = 92\%$.

d. $P(x)$ is close to $N = 88\%$.

e. $P(x)$ is close to $N = 93\%$.

ANSWER: e
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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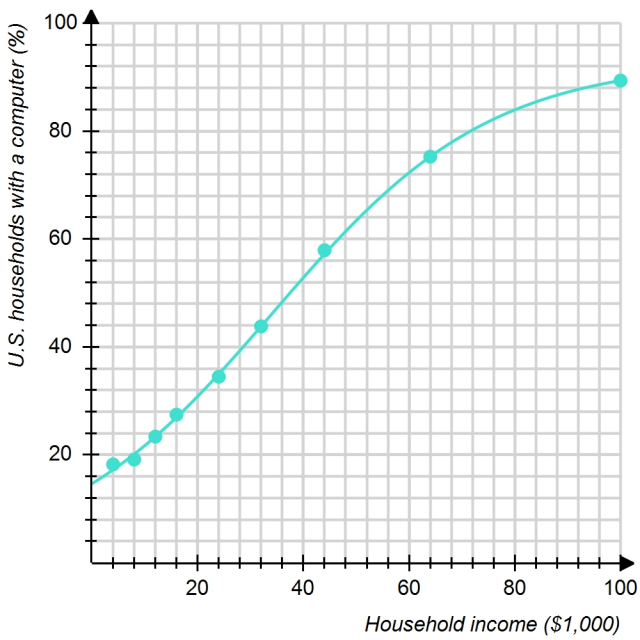
2.4 Logistic Functions and Models

13. The following graph shows the actual percentage of U.S. households with a computer as a function of household income (the data points) and a logistic model of these data (the curve). The logistic model is

$$P(x) = \frac{93}{1 + 5.35(1.05)^{-x}}$$

where x is the household income in thousands of dollars. For low incomes, the logistic model is approximately exponential. Which exponential model best approximates $P(x)$ for small x? Round the coefficients to the nearest hundredth.



a. $P(x) = 17.65(2.1)^{x}$

b. $P(x) = 14.65(1.05)^{-x}$

c. $P(x) = 17.65(1.05)^{x}$

d. $P(x) = 14.65(1.05)^{x}$

e. $P(x) = 14.65(2.1)^{-x}$

ANSWER: d
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: True
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2.4 Logistic Functions and Models

14. There are currently 1,000 cases of Venusian flu in a total susceptible population of 10,000 and the number of cases is increasing by 25% each day. Find a logistic model for the number of cases of Venusian flu and use your model to predict the number of flu cases a week from now. Round your answer to the nearest integer.

    a. $F(7) = 1{,}732$ cases
    b. $F(7) = 5{,}195$ cases
    c. $F(7) = 3{,}463$ cases
    d. $F(7) = 5{,}888$ cases
    e. $F(7) = 1{,}154$ cases

    ANSWER: c
    POINTS: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: True
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    DATE MODIFIED: 10/24/2016 4:22 PM

15. Last year's epidemic of Martian flu began with a single case in a total susceptible population of 10,000. The number of cases was increasing initially by 38% per day. Find a logistic model for the number of cases of Martian flu and use your model to predict the number of flu cases 2 weeks into the epidemic. Round your answer to the nearest integer.

    a. $P(14) = 153$ cases
    b. $P(14) = 45$ cases
    c. $P(14) = 90$ cases
    d. $P(14) = 30$ cases
    e. $P(14) = 135$ cases

    ANSWER: c
    POINTS: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: True
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2.4 Logistic Functions and Models

16. In Russia the average consumer drank two servings of Coca-Cola in 1993. This amount appeared to be increasing exponentially with a doubling time of 2 years. Given a long-range market saturation estimate of 100 servings per year, find a logistic model for the consumption of Coca-Cola in Russia and use your model to predict when, to the nearest year, the average consumption will be 43 servings per year.

    a. Sometime in 2005.
    b. Sometime in 1993.
    c. Sometime in 2003.
    d. Sometime in 2004.
    e. Sometime in 1994.

    ANSWER: c
    POINTS: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: True
    DATE CREATED: 2/10/2016 3:42 PM
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17. The chart shows the number of research articles in the prominent journal *Physics Review* that were written by researchers in Europe during 1983 - 2003 ($t = 0$ represents 1983).

Year, t	0	5	10	15	20
Research Articles, A(1,000)	1.2	2.1	3.8	5.1	5.7

    Determine the logistic regression model for the data? (Round all coefficients to two significant digits.) According to the model, how many *Physics Review* articles were published by U.S. researchers in 2001 ($t = 18$)?

    a. 5,300
    b. 5,000
    c. 6,100
    d. 5,800
    e. 5,700

    ANSWER: a
    POINTS: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
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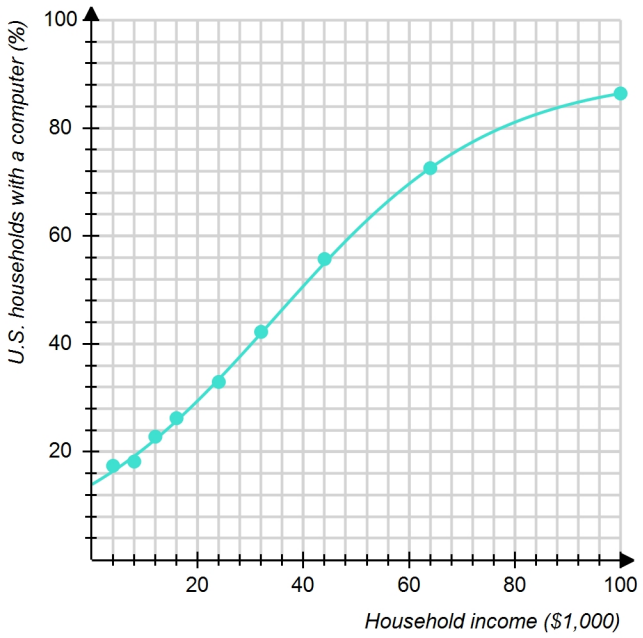
2.4 Logistic Functions and Models

18. The graph shows the actual percentage of U.S. households with a computer as a function of household income (the data points) and a logistic model of these data (the curve). The logistic model is

$$P(x) = \frac{90}{1 + 5.45(1.05)^{-x}}$$

where x is the household income in thousands of dollars. According to the model, what percentage of extremely wealthy households had computers?



$P =$ _____%

ANSWER: 90
POINTS: 1
QUESTION TYPE: Numeric Response
HAS VARIABLES: True
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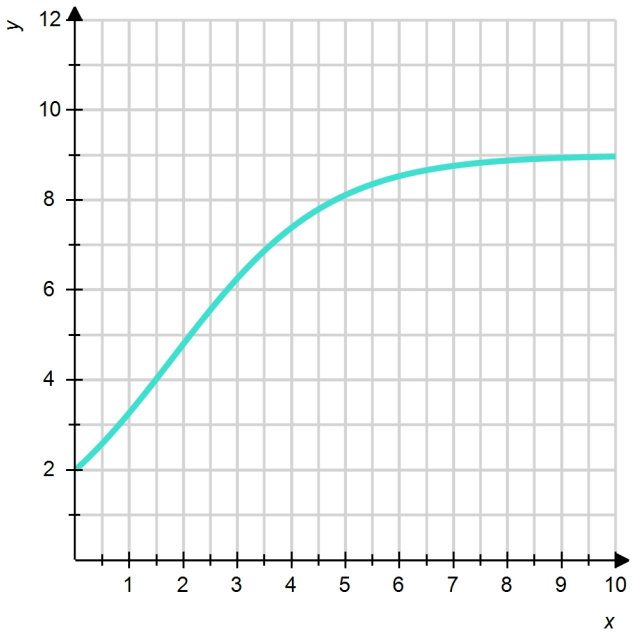
2.4 Logistic Functions and Models

19. Choose the logistic function that best approximates the curve.



(A) $f(x) = \dfrac{10}{1 + 1.5\left(3^{-x}\right)}$

(B) $f(x) = \dfrac{9}{1 + 3.5\left(2^{-x}\right)}$

(C) $f(x) = \dfrac{10}{1 + 1.5\left(1.05^{-x}\right)}$

_____

ANSWER: B
POINTS: 1
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: True
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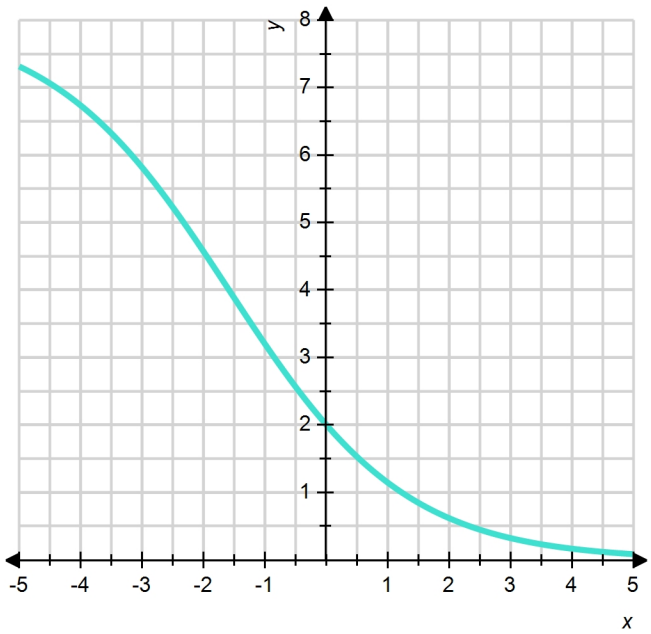
2.4 Logistic Functions and Models

20. Choose the logistic function that best approximates the curve.



(A) $f(x) = \dfrac{8}{1 + 7(0.5)^{-x}}$

(B) $f(x) = \dfrac{8}{1 + 3(0.5)^{-x}}$

(C) $f(x) = \dfrac{8}{1 + 3(3)^{-x}}$

_____

ANSWER: B
POINTS: 1
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: True
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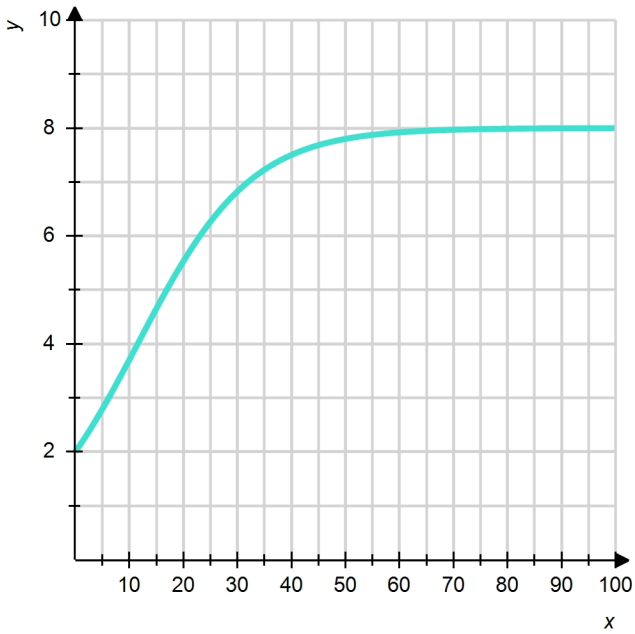
2.4 Logistic Functions and Models

21. Choose the logistic function that best approximates the curve.



(A) $f(x) = \dfrac{16}{2 + 6(4)^{-x}}$

(B) $f(x) = \dfrac{16}{2 + 5(1.1)^{-x}}$

(C) $f(x) = \dfrac{16}{2 + 6(1.1)^{-x}}$

_____

ANSWER: C
POINTS: 1
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: True
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22. The chart shows the number of research articles in the prominent journal *Physics Review* that were written by researchers in Europe during 1983 - 2003 ($t = 0$ represents 1983).

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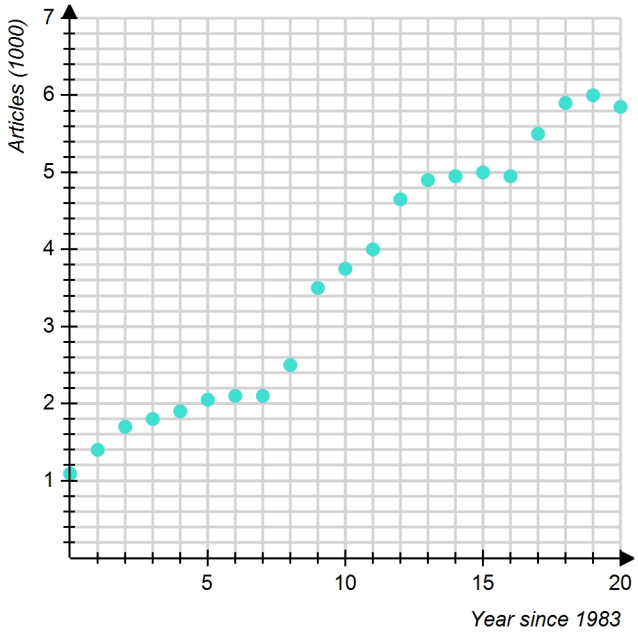
2.4 Logistic Functions and Models



Which of the following logistic functions best models the data? (t is the number of years since 1983.) Try to determine the correct model without actually computing data points.

(A) $A(t) = \dfrac{7.0}{1 + 5.4(1.2)^{-t}}$

(B) $A(t) = \dfrac{4.9}{1 + 4.3(1.2)^{-t}}$

(C) $A(t) = \dfrac{4.9}{1 + 4.3(0.7)^{-t}}$

(D) $A(t) = \dfrac{7.0}{1 + 5.4(0.7)^{-t}}$

_____

According to the model you selected, at what percentage was the number of articles growing around 1984?

_____%

ANSWER: A; 16
POINTS: 1
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: True

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2.4 Logistic Functions and Models

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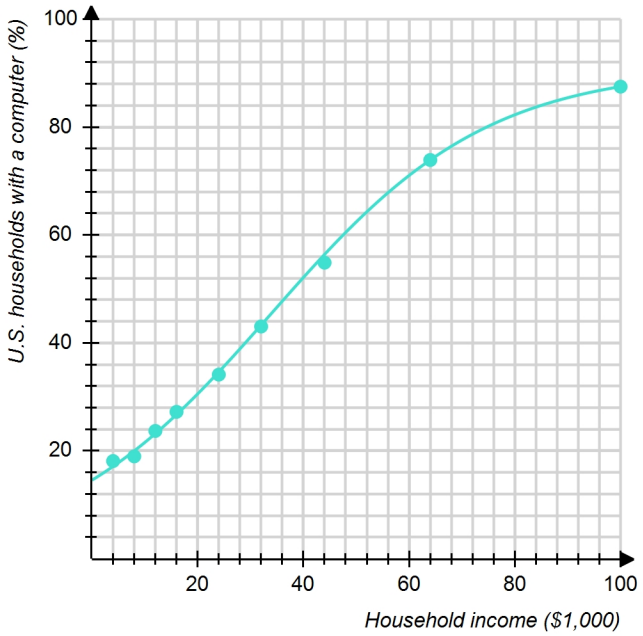
23. The following graph shows the actual percentage of U.S. households with a computer as a function of household income (the data points) and a logistic model of these data (the curve). The logistic model is

$$P(x) = \frac{91}{1 + 5.25(1.05)^{-x}}$$

where x is the household income in thousands of dollars. For low incomes, the logistic model is approximately exponential. Which exponential model best approximates $P(x)$ for small x? Round the coefficients to the nearest hundredth.



$P(x)$ = _____ ·(_____)^x

ANSWER: 14.56; 1.05
POINTS: 1
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: True
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2.4 Logistic Functions and Models

24. The chart shows the number of research articles in the prominent journal *Physics Review* that were written by researchers in Europe during 1983 - 2003 ($t = 0$ represents 1983).

Year, t	0	5	10	15	20
Research Articles, A(1,000)	1.2	2.1	3.8	5.1	5.7

What is the logistic regression model for the data? (Round all coefficients to two significant digits.)

$$A(t) = \frac{_____}{1 + _____ \cdot (_____)^{-t}}$$

At what value does the model predict that the number of research articles will level off?

_____ articles

According to the model, how many Physics Review articles were published by U.S. researchers in 1990 ($t = 7$)?

_____ articles

ANSWER: 6.3; 4.8; 1.2; 6,300; 2,700
POINTS: 1
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: False
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