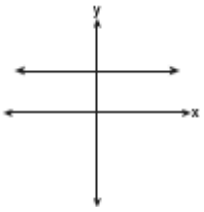
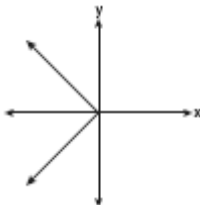
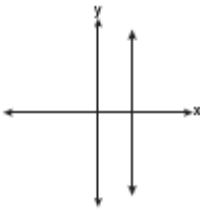
CHAPTER 1-3

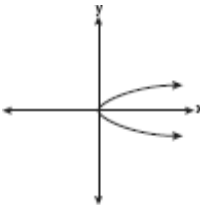
DEFINING FUNCTIONS

1. fall0730ia, P.I. A.G.3
Which graph represents a function?

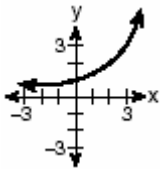
[A] 

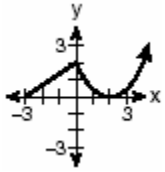
[B] 

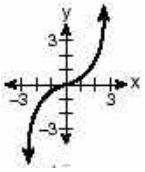
[C] 

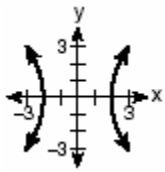
[D] 

2. 010511b, P.I. A.G.3
Which graph is *not* a function?

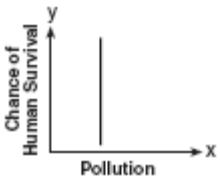
[A] 

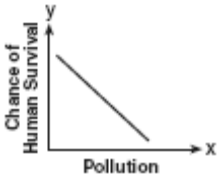
[B] 

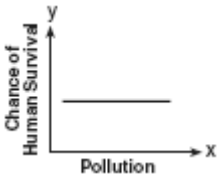
[C] 

[D] 

3. 080301b, P.I. A.G.3
Which graph does not represent a function of *x*?

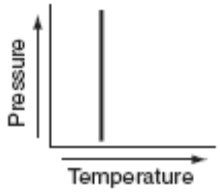
[A] 

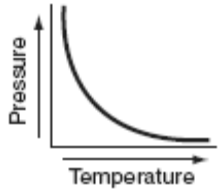
[B] 

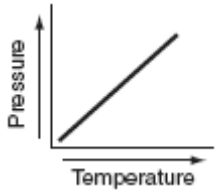
[C] 

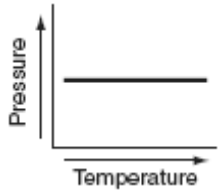
[D] 

4. 060601b, P.I. A.G.3
Each graph below represents a possible relationship between temperature and pressure. Which graph does *not* represent a function?

[A] 

[B] 

[C] 

[D] 

5. 080403b, P.I. A.G.3
Which set of ordered pairs is *not* a function?

[A] {(1,2), (3,4), (4,5), (5,6)}

[B] {(3,1), (2,1), (1,2), (3,2)}

[C] {(4,1), (5,1), (6,1), (7,1)}

[D] {(0,0), (1,1), (2,2), (3,3)}

6. 060715b, P.I. A.G.3
Which set of ordered pairs does *not* represent a function?

[A] {(3,-2), (4,-3), (5,-4), (6,-5)}

[B] {(3,-2), (3,-4), (4,-1), (4,-3)}

[C] {(3,-2), (5,-2), (4,-2), (-1,-2)}

[D] {(3,-2), (-2,3), (4,-1), (-1,4)}

7. 080101b, P.I. A2.A.38
Which relation is *not* a function?

[A] $y = x^2 - 4x + 3$ [B] $y = 2x + 4$

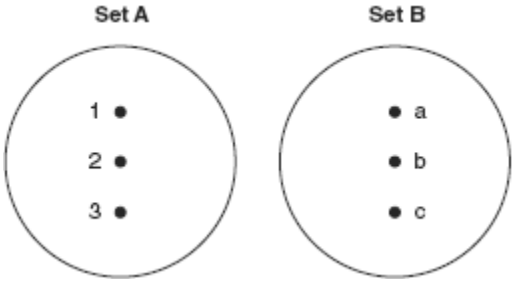
[C] $x = y^2 + 2x - 3$ [D] $x = 3y - 2$

8. 080605b, P.I. A2.A.38
Which equation does *not* represent a function?

[A] $x = \pi$ [B] $y = 4$

[C] $y = |x|$ [D] $y = x^2 + 5x$

9. 010622b, P.I. A2.A.37
On the accompanying diagram, draw a mapping of a relation from set *A* to set *B* that is *not* a function. Explain why the relationship you drew is *not* a function.



10. 010211b, P.I. A2.A.38
Which relation is a function?

[A] $x = y^2 + 1$ [B] $x = 4$

[C] $y = \sin x$ [D] $x^2 + y^2 = 16$

11. 060213b, P.I. A2.A.38
Which equation represents a function?

[A] $4y^2 = 36 - 9x^2$ [B] $y = x^2 - 3x - 4$

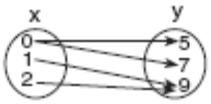
[C] $x^2 + y^2 = 4$ [D] $x = y^2 - 6x + 8$

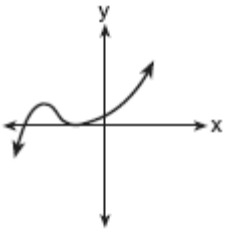
12. 060511b, P.I. A2.A.38
Which relation is a function?

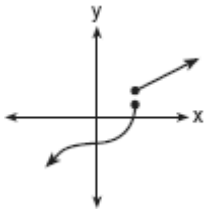
[A] $x^2 + y^2 = 7$ [B] $x^2 - y^2 = 7$

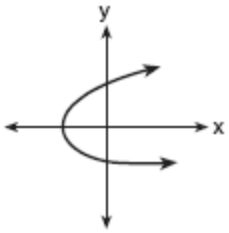
[C] $x = 7$ [D] $xy = 7$

13. 060310b, P.I. A.G.3
Which diagram represents a relation in which each member of the domain corresponds to only one member of its range?

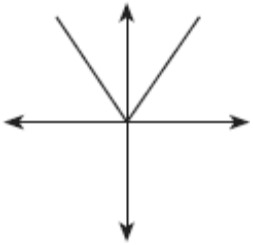
[A]


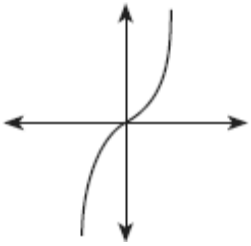
[B]


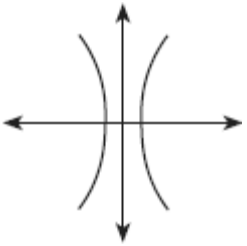
[C]


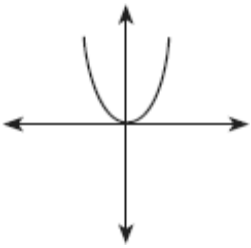
[D]


14. 060216b, P.I. A2.A.43
Which diagram represents a one-to-one function?

[A]


[B]


[C]


[D]


DOMAIN AND RANGE

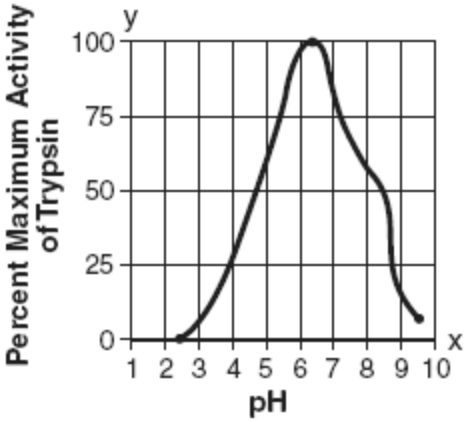
15. 060501b, P.I. A2.A.51
The accompanying graph shows the heart rate, in beats per minute, of a jogger during a 4-minute interval.

What is the range of the jogger's heart rate during this interval?

[A] 1-4 [B] 60-110

[C] 0-110 [D] 0-4

16. 010712b, P.I. A2.A.51
Data collected during an experiment are shown in the accompanying graph.

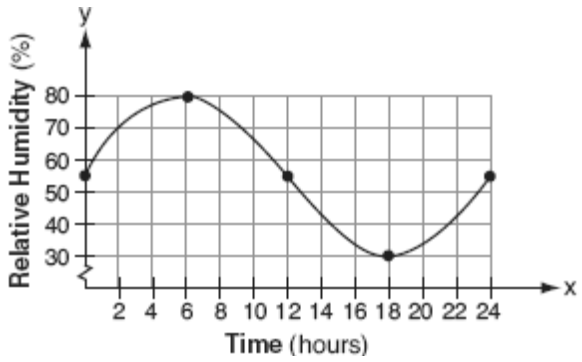


What is the range of this set of data?

[A] $1 \le x \le 10$ [B] $0 \le y \le 100$

[C] $2.5 \le x \le 9.5$ [D] $2.5 \le y \le 9.5$

17. 080708b, P.I. A2.A.51
A meteorologist drew the accompanying graph to show the changes in relative humidity during a 24-hour period in New York City.

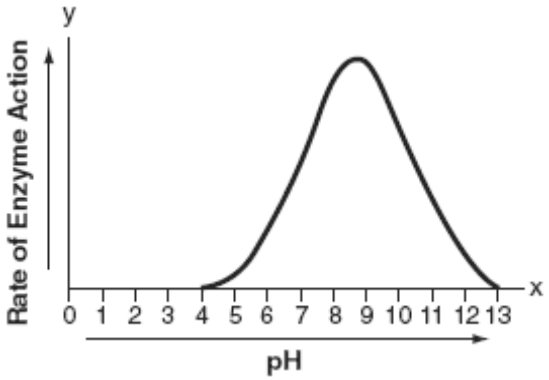


What is the range of this set of data?

[A] $30 \le x \le 80$ [B] $0 \le y \le 24$

[C] $0 \le x \le 24$ [D] $30 \le y \le 80$

18. 010602b, P.I. A2.A.51
The effect of pH on the action of a certain enzyme is shown on the accompanying graph.



What is the domain of this function?

[A] $4 \le x \le 13$ [B] $x \ge 0$

[C] $y \ge 0$ [D] $4 \le y \le 13$

19. 080204b, P.I. A2.A.39
What is the domain of $f(x) = 2^x$?

[A] all real numbers [B] $x \ge 0$

[C] all integers [D] $x \le 0$

20. 010218b, P.I. A2.A.39
What is the domain of $h(x) = \sqrt{x^2 - 4x - 5}$?

[A] $\{x \mid x \ge 1 \text{ or } x \le -5\}$

[B] $\{x \mid -5 \le x \le 1\}$ [C] $\{x \mid -1 \le x \le 5\}$

[D] $\{x \mid x \ge 5 \text{ or } x \le -1\}$

21. 060407b, P.I. A2.A.39
What is the domain of the function $f(x) = \dfrac{2x^2}{x^2 - 9}$?

[A] all real numbers except 3

[B] all real numbers except 0

[C] all real numbers

[D] all real numbers except 3 and -3

22. 010504b, P.I. A2.A.39
What is the domain of the function $f(x) = \dfrac{3x^2}{x^2 - 49}$?

[A] $\{x \mid x \in \text{real numbers}, x \ne 7\}$

[B] $\{x \mid x \in \text{real numbers}, x \ne \pm 7\}$

[C] $\{x \mid x \in \text{real numbers}\}$

[D] $\{x \mid x \in \text{real numbers}, x \ne 0\}$

23. 010314b, P.I. A2.A.39
If $f(x) = \dfrac{1}{\sqrt{2x-4}}$, the domain of $f(x)$ is

[A] $x \ge 2$ [B] $x < 2$

[C] $x > 2$ [D] $x = 2$

FUNCTIONAL NOTATION

24. 060406b, P.I. A2.A.41
If $f(x) = 4x^0 + (4x)^{-1}$, what is the value of $f(4)$?

[A] $1\dfrac{1}{16}$ [B] -12 [C] $4\dfrac{1}{16}$ [D] 0

25. 080701b, P.I. A2.A.41
If $f(x) = (x^{-x} - x^0 + 2^x)$, then $f(3)$ is equal to

[A] $7\frac{1}{27}$ [B] -22

[C] $8\frac{1}{27}$ [D] -21

26. 010220b, P.I. A.A.6
The revenue, $R(x)$, from selling x units of a product is represented by the equation $R(x) = 35x$, while the total cost, $C(x)$, of making x units of the product is represented by the equation $C(x) = 20x + 500$. The total profit, $P(x)$, is represented by the equation $P(x) = R(x) - C(x)$. For the values of $R(x)$ and $C(x)$ given above, what is $P(x)$?

[A] $15x + 500$ [B] $10x + 100$

[C] $15x$ [D] $15x - 500$

27. 080332b, P.I. A.A.6
A company calculates its profit by finding the difference between revenue and cost. The cost function of producing x hammers is $C(x) = 4x + 170$. If each hammer is sold for \$10, the revenue function for selling x hammers is $R(x) = 10x$. How many hammers must be sold to make a profit? How many hammers must be sold to make a profit of \$100?

CHAPTER 1-4

COMPOSITIONS OF FUNCTIONS

28. 010501b, P.I. A2.A.42
If $f(x) = -2x + 7$ and $g(x) = x^2 - 2$, then $f(g(3))$ is equal to

[A] -7 [B] -3 [C] -1 [D] 7

29. 010621b, P.I. A2.A.42
If $f(x) = 5x^2 - 1$ and $g(x) = 3x - 1$, find $g(f(1))$.

30. 060322b, P.I. A2.A.42
If $f(x) = 2^x - 1$ and $g(x) = x^2 - 1$, determine the value of $(f \circ g)(3)$.

31. 010207b, P.I. A2.A.42
If $f(x) = 5x^2$ and $g(x) = \sqrt{2x}$, what is the value of $(f \circ g)(8)$?

[A] 16 [B] 1,280 [C] 80 [D] $8\sqrt{10}$

32. 060725b, P.I. A2.A.42
If $f(x) = \log_2 x$ and $g(x) = 2x^2 + 14$, determine the value of $(f \circ g)(5)$.

33. 010331b, P.I. A2.A.42
If $f(x) = x^{\frac{2}{3}}$ and $g(x) = 8x^{-\frac{1}{2}}$, find $(f \circ g)(x)$ and $(f \circ g)(27)$.

34. 080313b, P.I. A2.A.42
If f and g are two functions defined by $f(x) = 3x + 5$ and $g(x) = x^2 + 1$, then $g(f(x))$ is

[A] $3x^2 + 8$ [B] $9x^2 + 26$

[C] $x^2 + 3x + 6$ [D] $9x^2 + 30x + 26$

35. 010408b, P.I. A2.A.42
If $f(x) = \frac{2}{x+3}$ and $g(x) = \frac{1}{x}$, then $(g \circ f)(x)$ is equal to

[A] $\frac{1+3x}{2x}$ [B] $\frac{2x}{1+3x}$

[C] $\frac{x+3}{2x}$ [D] $\frac{x+3}{2}$

36. 060417b, P.I. A2.A.42
If $f(x) = x + 1$ and $g(x) = x^2 - 1$, the expression $(g \circ f)(x)$ equals 0 when x is equal to

[A] 0 and -2 [B] -2, only

[C] 0, only [D] 1 and -1

37. 060210b, P.I. A2.A.42
If $f(x) = 2x^2 + 4$ and $g(x) = x - 3$, which number satisfies $f(x) = (f \circ g)(x)$?

[A] $\frac{3}{4}$ [B] 5 [C] 4 [D] $\frac{3}{2}$

38. 010812b, P.I. A2.A.42
The accompanying tables define functions f and g.

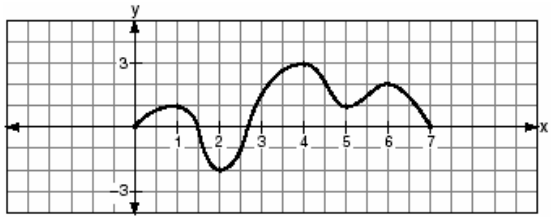
x	1	2	3	4	5
$f(x)$	3	4	5	6	7

x	3	4	5	6	7
$g(x)$	4	6	8	10	12

What is (g o f)(3)?

[A] 8 [B] 6 [C] 4 [D] 2

39. 080520b, P.I. A2.A.42
The accompanying graph is a sketch of the function $y = f(x)$ over the interval $0 \le x \le 7$.



What is the value of $(f \circ f)(6)$?

[A] 0 [B] 1 [C] 2 [D] -2

40. 060526b, P.I. A2.A.42
A certain drug raises a patient's heart rate, $h(x)$, in beats per minute, according to the function $h(x) = 70 + 0.2x$, where x is the bloodstream drug level, in milligrams. The level of the drug in the patient's bloodstream is a function of time, t, in hours, according to the formula $g(t) = 300(0.8)^t$. Find the value of $h(g(4))$, the patient's heart rate in beats per minute, to the *nearest whole number*.

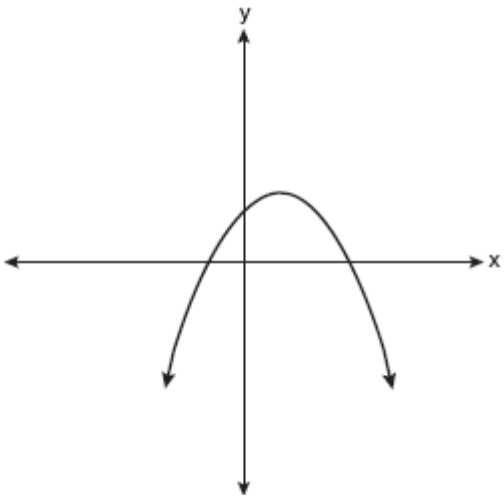
41. 060605b, P.I. A2.A.42
The temperature generated by an electrical circuit is represented by $t = f(m) = 0.3m^2$, where m is the number of moving parts. The resistance of the same circuit is represented by $r = g(t) = 150 + 5t$, where t is the temperature. What is the resistance in a circuit that has four moving parts?

[A] 8,670 [B] 51 [C] 174 [D] 156

CHAPTER 1-5

IDENTIFYING FUNCTIONS AND RELATIONS

42. fall0717ia, P.I. A.G.4
Which type of graph is shown in the diagram below?



[A] exponential [B] absolute value
[C] quadratic [D] linear

43. 080723a

When graphed on the coordinate plane, the equations $y = 2x^2 + 4x + 5$ and $x^2 + y^2 = 36$ form

[A] two parabolas

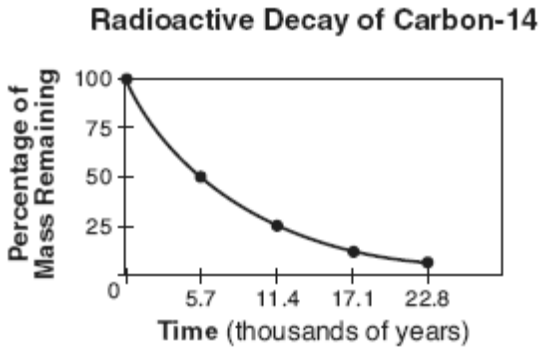
[B] a parabola and a circle

[C] a parabola and a straight line

[D] two circles

44. 080710b, P.I. A.G.4

Which type of function could be used to model the data shown in the accompanying graph?



[A] exponential [B] quadratic

[C] linear [D] trigonometric

45. 080714b, P.I. A.G.4

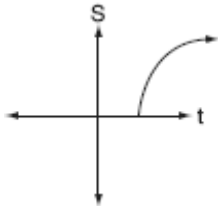
The graph of which function is symmetric with respect to the graph of the line $y = x$?

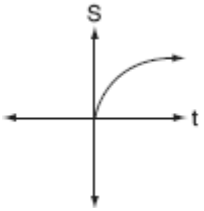
[A] $y = \frac{1}{x}$ [B] $y = \log x$

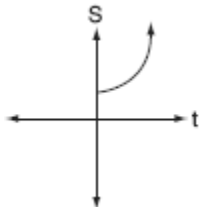
[C] $y = x^3$ [D] $y = x^2$

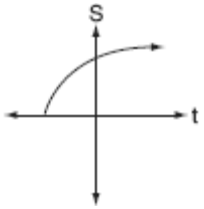
46. 060718b, P.I. A2.A.13

The formula $S = 20\sqrt{t + 273}$ is used to determine the speed of sound, *S*, in meters per second, near Earth's surface, where *t* is the surface temperature, in degrees Celsius. Which graph best represents this function?

[A] 

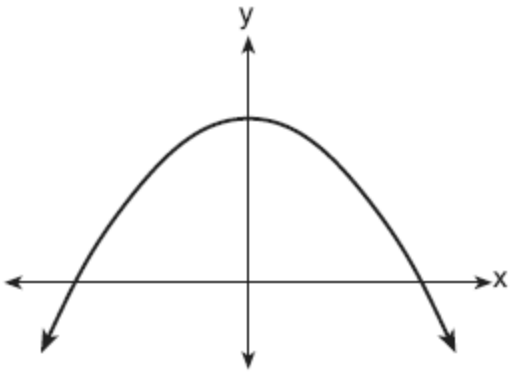
[B] 

[C] 

[D] 

47. 060703b, P.I. A.G.4

Which equation is best represented by the accompanying graph?



[A] $y = 6x^2$ [B] $y = 6x + 1$

[C] $y = -x^2 + 1$ [D] $y = 6^x$

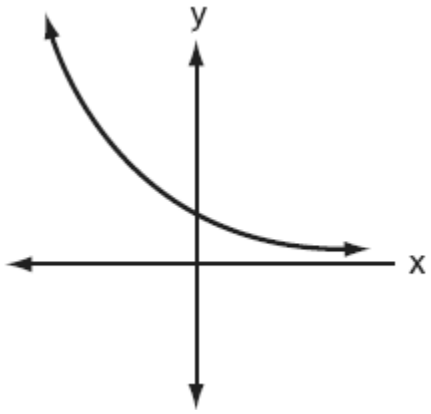
48. 010714a

The graph of the equation $x^2 + y^2 = r^2$ forms

[A] a straight line [B] a circle

[C] two intersecting lines [D] a parabola

49. 010701b, P.I. A.G.4
Which equation best represents the accompanying graph?



[A] $y = 2^{-x}$ [B] $y = -2^{x}$

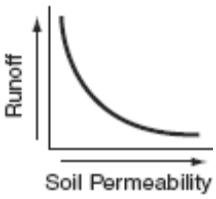
[C] $y = 2^{x}$ [D] $y = x^2 + 2$

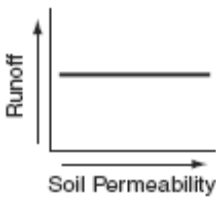
50. 060616b
Which equation represents a hyperbola?

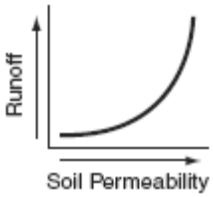
[A] $y = 16x^2$ [B] $y = \frac{16}{x}$

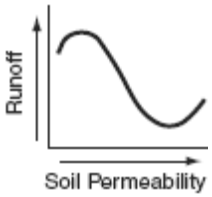
[C] $y = 16 - x^2$ [D] $y^2 = 16 - x^2$

51. 010603b
Which graph shows that soil permeability varies inversely to runoff?

[A]


[B]


[C]


[D]


52. 080528a
The graph of the equation $x^2 + y^2 = 4$ can be described as a

[A] circle with its center at the origin and a radius of 4

[B] line passing through points (0,2) and (2,0)

[C] parabola with its vertex at (0,2)

[D] circle with its center at the origin and a radius of 2

53. 080426a
Which equation represents the locus of points 4 units from the origin?

[A] $x^2 + y^2 = 4$ [B] $x + y = 16$

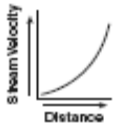
[C] $x^2 + y^2 = 16$ [D] $x = 4$

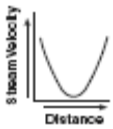
54. 060414b
Which function is symmetrical with respect to the origin?

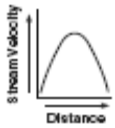
[A] $y = 5^{x}$ [B] $y = \sqrt{x+5}$

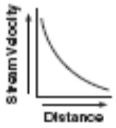
[C] $y = |5 - x|$ [D] $y = -\frac{5}{x}$

55. 060408b
Which graph represents an inverse variation between stream velocity and the distance from the center of the stream?

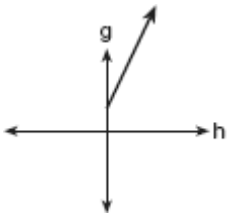
[A]


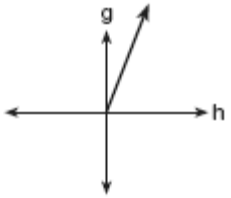
[B]


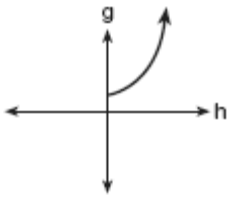
[C]


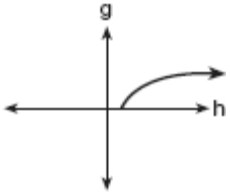
[D]


56. 010420b
The cells of a particular organism increase logarithmically. If *g* represents cell growth and *h* represents time, in hours, which graph best represents the growth pattern of the cells of this organism?

[A] 

[B] 

[C] 

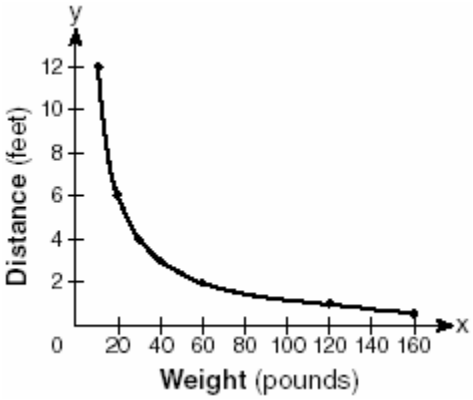
[D] 

57. 010419b, P.I. A.A.41
What is the axis of symmetry of the graph of the equation $x = y^2$?

[A] line $y = x$ [B] line $y = -x$

[C] x-axis [D] y-axis

58. 080312b
The accompanying graph shows the relationship between a person's weight and the distance that the person must sit from the center of a seesaw to make it balanced.

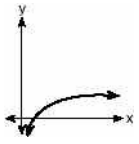


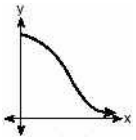
Which equation best represents this graph?

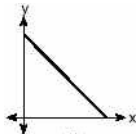
[A] $y = 2\log x$ [B] $y = 12x^2$

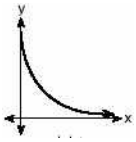
[C] $y = -120x$ [D] $y = \frac{120}{x}$

59. 080304b, P.I. A.G.4
The strength of a medication over time is represented by the equation $y = 200(1.5)^{-x}$, where x represents the number of hours since the medication was taken and y represents the number of micrograms per millimeter left in the blood. Which graph best represents this relationship?

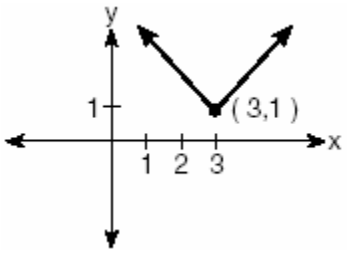
[A] 

[B] 

[C] 

[D] 

60. 060314b, P.I. A.G.4
Which equation is represented by the accompanying graph?



[A] $y = |x+3|-1$ [B] $y = (x-3)^2+1$

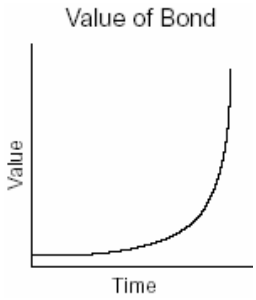
[C] $y = |x-3|+1$ [D] $y = |x|-3$

61. 010310b
For a rectangular garden with a fixed area, the length of the garden varies inversely with the width. Which equation represents this situation for an area of 36 square units?

[A] $y = 36x$ [B] $x + y = 36$

[C] $y = \frac{36}{x}$ [D] $x - y = 36$

62. 010203b, P.I. A.G.4
The accompanying graph represents the value of a bond over time.



Which type of function does this graph best model?

[A] trigonometric [B] exponential

[C] quadratic [D] logarithmic

63. 060104b, P.I. A2.A.5
Camisha is paying a band $330 to play at her graduation party. The amount each member earns, *d*, varies inversely as the number of members who play, *n*. The graph of the equation that represents the relationship between *d* and *n* is an example of

[A] a hyperbola [B] a parabola

[C] a line [D] an ellipse

[1] A

[2] D

[3] A

[4] A

[5] B

[6] B

[7] C

[8] A

[9] [2] A mapping is drawn that maps at least one element of set A to more than one element of set B, and an appropriate explanation of the difference between functions and relations is written.
[1] An appropriate mapping is drawn, but no explanation is written.
or [1] An incorrect mapping is drawn, but an appropriate explanation is written.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[10] C

[11] B

[12] D

[13] B

[14] B

[15] B

[16] B

[17] D

[18] A

[19] A

[20] D

[21] D

[22] B

[23] C

[24] C

[25] A

[26] D

[27] [4] 29 hammers to make a profit and 45 hammers to make a profit of $100, and appropriate work is shown.
[3] Appropriate work is shown, but one computational or rounding error is made.
[2] Appropriate work is shown, but two or more computational or rounding errors are made.
or [2] Either the number of hammers to make a profit or the number of hammers to make a profit of $100 is determined correctly, and appropriate work is shown.
[1] One conceptual and one computational error are made.
or [1] The correct equation and inequality or the correct equations are written, but no further correct work is shown.
or [1] 29 hammers to make a profit and 45 hammers to make a profit of $100, but no work is shown.
[0] 29 and 45, but no work is shown and the answers are not labeled.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[28] A

[2] 11, and appropriate work is shown, such as f(l) = 4 and g(4) = 11.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made, such as solving for f(g(l)).
or [1] 11, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[29]

[2] 255, and appropriate work is shown, such as $g(3) = 3^2 - 1$ and $f(8) = 2^8 - 1 = 255$.
[1] Appropriate work is shown, but one computational error is made.
or [1] One conceptual error is made, such as evaluating $(g \circ f)(3)$.
or [1] 255, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[30]

[31] C

[2] 6, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made, such as evaluating $(g \circ f)(5)$, resulting in an answer of 24.78270016.
or [1] 6, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[32]

[4] $(f \circ g)(x) = 4x^{-\frac{1}{3}}$ or $(8x^{-\frac{1}{2}})^{\frac{2}{3}}$ or an equivalent answer and $(f \circ g)(27) = \frac{4}{3}$ or an equivalent answer, and appropriate work is shown.

[3] Simplification is shown to at least $4x^{-\frac{1}{3}}$, but one computational error or an error in the Law of Exponents is made when finding $(f \circ g)(27)$.
[2] $(f \circ g)(x)$ is determined correctly, but $(f \circ g)(27)$ is not found or is found incorrectly.
or [2] $\frac{4}{3}$ or an equivalent answer, and appropriate work is shown, but an expression for $(f \circ g)(x)$ is not found or is found incorrectly.
[1] $4x^{-\frac{1}{3}}$ and $\frac{4}{3}$ or equivalent answers, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[33]

[34] D

[35] D

[36] A

[37] D

[38] A

[39] D

[2] 95, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] Appropriate work is shown, but one conceptual error is made, such as calculating g(h(4)).
or [1] 95, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[40]

[41] C

[42] C

[43] B

[44] A

[45] A

[46] D

[47] C

[48] B

[49] A

[50] B

[51] A

[52] D

[53] C

[54] D

[55] D

[56] D

[57] C

[58] D

[59] D

[60] C

[61] C

[62] B

[63] A