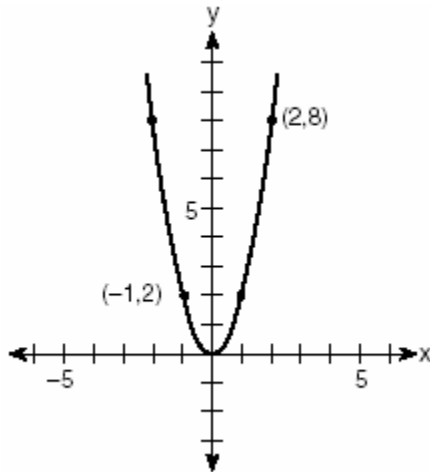


## Section 13-2: The Graph of a Quadratic Function

1. 060404b, P.I. A.G.4

Which quadratic function is shown in the accompanying graph?



[A]  $y = -\frac{1}{2}x^2$

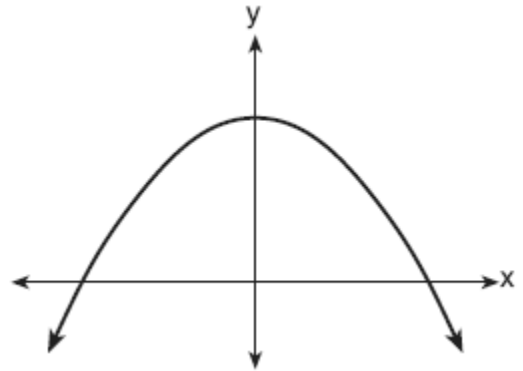
[B]  $y = -2x^2$

[C]  $y = 2x^2$

[D]  $y = \frac{1}{2}x^2$

2. 060703b, P.I. A.G.4

Which equation is best represented by the accompanying graph?



[A]  $y = -x^2 + 1$

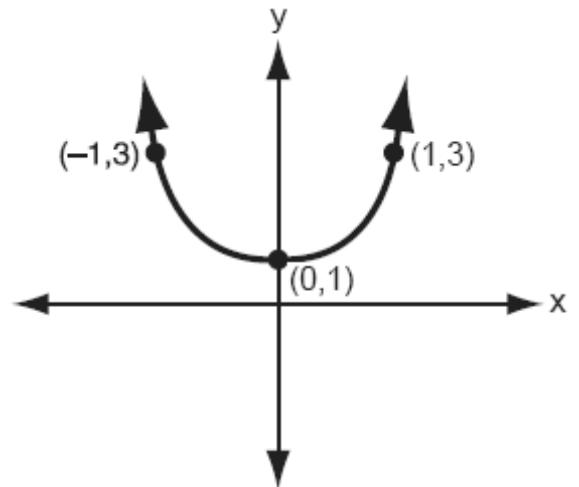
[B]  $y = 6x + 1$

[C]  $y = 6x^2$

[D]  $y = 6^x$

3. 010801b, P.I. A.G.4

Which equation is represented by the accompanying graph?



[A]  $y = x^2$

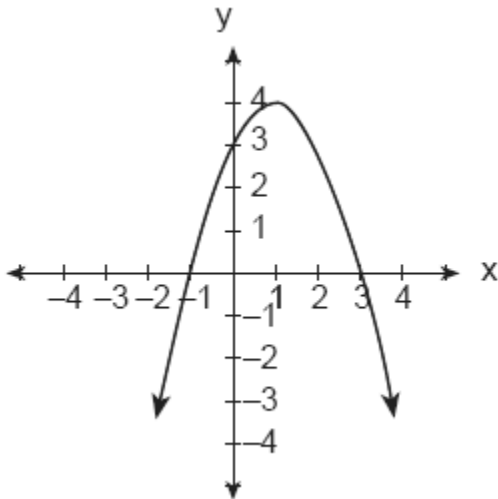
[B]  $y = 2(x^2 + 1)$

[C]  $y = 2x^2 + 1$

[D]  $y = 2x^2$

4. 080017a, P.I. A.G.4

Which is an equation of the parabola shown in the accompanying diagram?

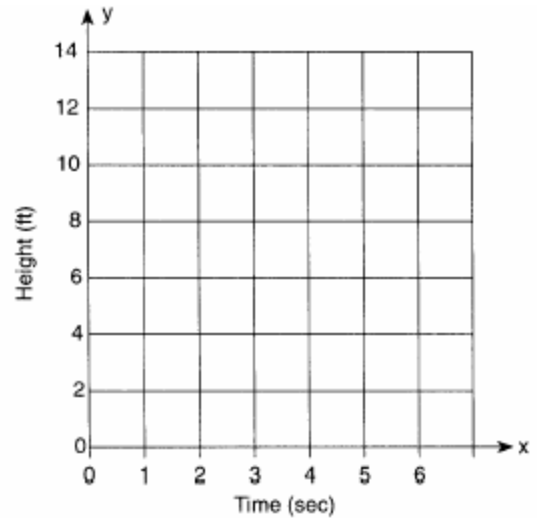


- [A]  $y = x^2 - 2x + 3$       [B]  $y = x^2 + 2x + 3$   
[C]  $y = -x^2 + 2x + 3$       [D]  $y = -x^2 - 2x + 3$

5. 010031a, P.I. A.G.4

Amy tossed a ball in the air in such a way that the path of the ball was modeled by the equation  $y = -x^2 + 6x$ . In the equation,  $y$  represents the height of the ball in feet and  $x$  is the time in seconds.

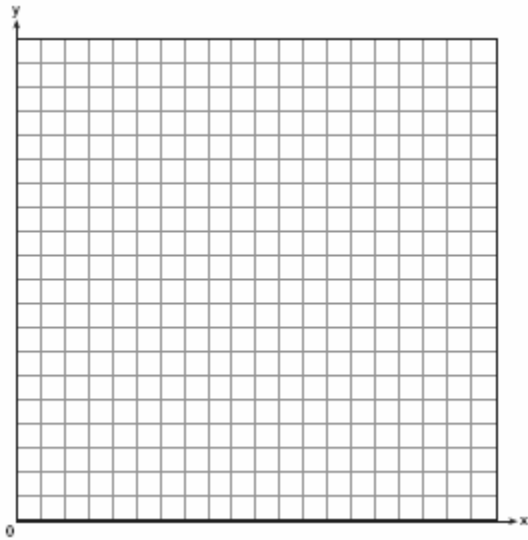
a Graph  $y = -x^2 + 6x$  for  $0 \leq x \leq 6$  on the grid provided below.



b At what time,  $x$ , is the ball at its highest point?

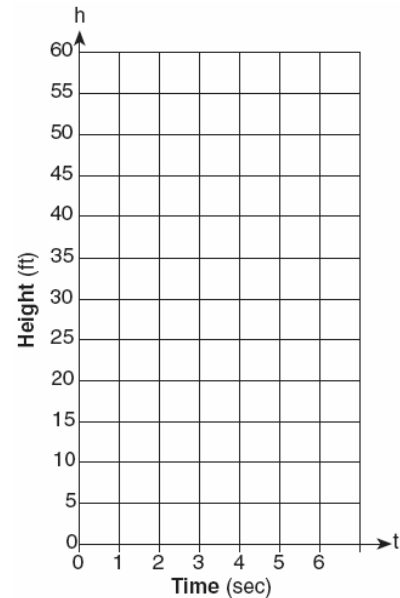
6. 060333a, P.I. A.G.4

An architect is designing a museum entranceway in the shape of a parabolic arch represented by the equation  $y = -x^2 + 20x$ , where  $0 \leq x \leq 20$  and all dimensions are expressed in feet. On the accompanying set of axes, sketch a graph of the arch and determine its maximum height, in feet.



7. 010439a, P.I. A.G.4

Tom throws a ball into the air. The ball travels on a parabolic path represented by the equation  $h = -8t^2 + 40t$ , where  $h$  is the height, in feet, and  $t$  is the time, in seconds.  
*a* On the accompanying set of axes, graph the equation from  $t = 0$  to  $t = 5$  seconds, including all integral values of  $t$  from 0 to 5.

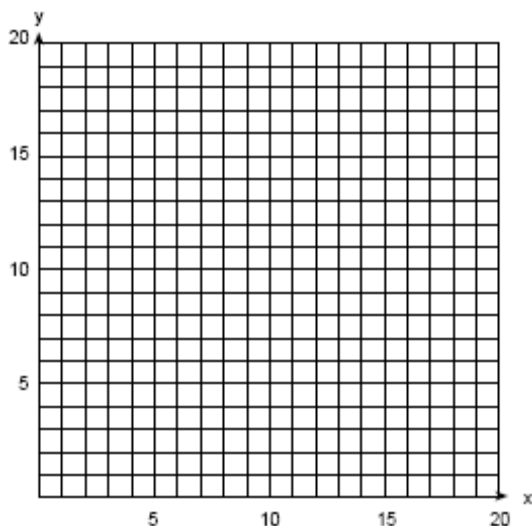


*b* What is the value of  $t$  at which  $h$  has its greatest value?

8. 089933a, P.I. A.G.4

An arch is built so that it is 6 feet wide at the base. Its shape can be represented by a parabola with the equation  $y = -2x^2 + 12x$ , where  $y$  is the height of the arch.

a Graph the parabola from  $x = 0$  to  $x = 6$  on the grid below.

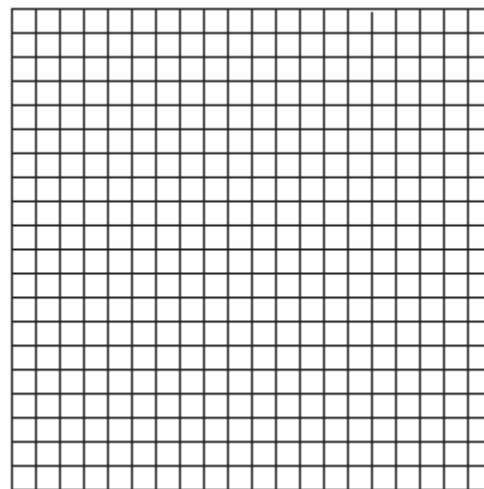


b Determine the maximum height,  $y$ , of the arch.

9. 060632b, P.I. A.G.4

A small rocket is launched from a height of 72 feet. The height of the rocket in feet,  $h$ , is represented by the equation

$h(t) = -16t^2 + 64t + 72$ , where  $t$  = time, in seconds. Graph this equation on the accompanying grid. Use your graph to determine the number of seconds that the rocket will remain at or above 100 feet from the ground. [Only a graphic solution can receive full credit.]



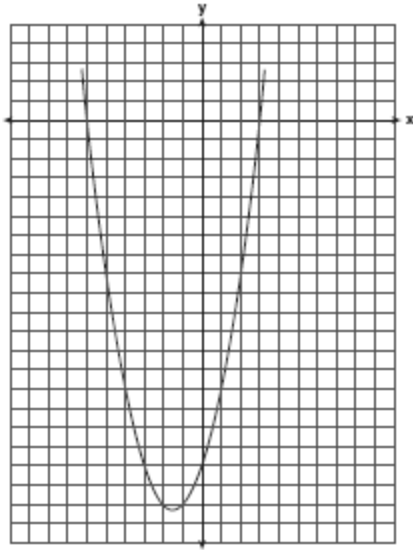
10. 080508a, P.I. A.A.8

The height of a golf ball hit into the air is modeled by the equation  $h = -16t^2 + 48t$ , where  $h$  represents the height, in feet, and  $t$  represents the number of seconds that have passed since the ball was hit. What is the height of the ball after 2 seconds?

[A] 80 ft [B] 32 ft [C] 64 ft [D] 16 ft

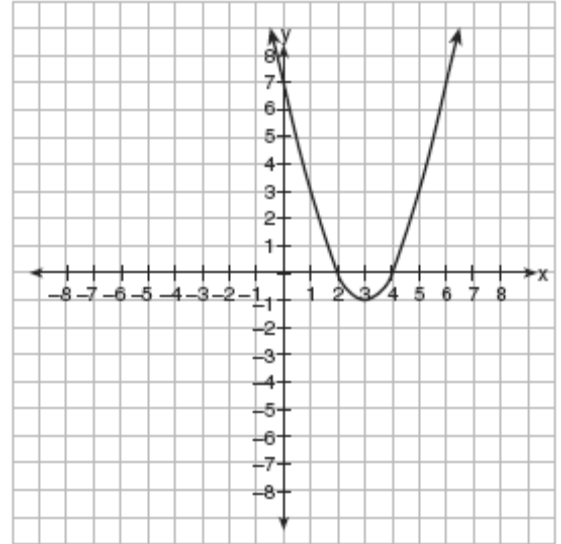
11. 010328a, P.I. A.G.4

The graph of a quadratic equation is shown in the accompanying diagram. The scale on the axes is a unit scale. Write an equation of this graph in standard form.



12. 010606b, P.I. A.G.10

Which is an equation of the line of symmetry for the parabola in the accompanying diagram?



[A]  $x = 2$

[B]  $x = 4$

[C]  $y = 3$

[D]  $x = 3$

13. 060514b, P.I. A.A.41

For which quadratic equation is the axis of symmetry  $x = 3$ ?

[A]  $y = -x^2 + 3x + 5$       [B]  $y = x^2 + 6x + 3$

[C]  $y = -x^2 + 6x + 2$       [D]  $y = x^2 + x + 3$

[1] C

[2] A

[3] C

[4] C

*a* [3] A parabola is correctly graphed through (0,0), (1,5), (2,8), (3,9), (4,8), (5,5), and (6,0).

[2] The correct table of values is shown but is not graphed through the entire domain.

or [2] The correct points are graphed but as a broken line graph not a curve.

or [2] At least three values are correctly calculated and graphed.

[1] At least two of the values are correctly calculated, and the student tried to graph all points.

*b* [1] 3

or [1] The correct time,  $x$ , for an incorrect graph in part a is found.

*a* and *b* [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an

[5] obviously incorrect procedure.

[4] 100 and a correct parabolic arch is drawn, and appropriate work is shown, such as a table of values for the parabola or correctly labeled points.

[3] 100 and a correct parabolic arch is drawn, but no table of values or labeled points are shown.

or [3] 100 and a correct parabolic arch is drawn, and appropriate work is shown, but no scale or an incorrect scale is shown.

or [3] A correct parabolic arch is drawn, but the maximum height is missing or is incorrect.

[2] An incorrect parabolic arch is drawn, but an appropriate maximum height is found.

or [2] A correct height is determined algebraically, but a parabolic arch is not drawn.

or [2] 100 and an appropriate parabolic arch is drawn, but it is not drawn between  $0 \leq x \leq 20$ .

[1] A correct parabolic arch is drawn, but no work is shown, such as a table of values or correctly labeled points, and the maximum height is missing or is incorrect.

or [1] 100, but no work is shown and no parabolic arch is drawn.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[6] incorrect procedure.

- a [3] A parabola with points graphed at (0,0), (1,32), (2,48), (3,48), (4,32), and (5,0) is shown. [Points do not have to be labeled on the graph for full credit.]  
[2] Appropriate work is shown, such as a table of values, but one graphing error is made.  
or [2] The correct points are graphed, but the parabola is drawn incorrectly, such as connecting (2,48) and (3,48) as a line segment or not connecting the points at all.  
or [2] At least four correct values are found, and the parabola is graphed appropriately.  
or [2] A correct table of values is shown for all values from 0 to 5, but no graph is drawn.  
[1] Two or three correct values are found, and the parabola is graphed appropriately.  
or [1] A correct table of values is shown for an incorrectly transcribed equation, such as  $h = 8t^2 + 40t$ , but no graph is drawn.  
b [1] 2.5 is found algebraically or identified from a table or from the graph of the parabola.  
or [1] An appropriate value of  $t$  is found, based on an incorrect graph.  
or [1]  $2 < t < 3$  is given as the range of values based on the line segment drawn in part a.  
a and b [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- a [3] A parabola is correctly graphed through (0,0), (1,10), (2,16), (3,18), (4,16), (5,10), and (6,0).  
[2] A correct table of values is shown, but not all the points are graphed correctly.  
or [2] The correct points are graphed but as a broken-line graph, not a curve.  
or [2] At least four values are calculated correctly and graphed.  
[1] The student has at least two of the values calculated correctly and has tried to graph all the points.  
[0] Fewer than two values are calculated correctly.  
b [1] A maximum height of 18 is found.  
or [1] Correct  $y$  is found for an incorrect graph in part a.  
a and b [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- 
- [4] A correct graph is drawn, and 3.  
[3] 3, and appropriate work is shown, but one graphing error is made.  
or [3] A correct graph is drawn and the points 0.5 and 3.5 are identified, but the difference is not calculated.  
[2] Appropriate work is shown, but two or more graphing errors are made.  
or [2] Appropriate work is shown, but one conceptual error is made.  
or [2] 3, but a method other than a graphic solution is used.  
[1] Appropriate work is shown, but one conceptual error and one graphing error are made.  
or [1] A correct graph is sketched with  $t = 0$  to  $t = 4$ , but no further correct work is shown.  
or [1] 3, but no work is shown and no graph is drawn.  
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- 

- [10] B

[3]  $y = x^2 + 3x - 18$ , and appropriate work leading from the roots to the equation is shown.

[2] Appropriate work is shown, but one computational error is made.

or [2]  $x^2 + 3x - 18 = 0$ , but appropriate work is shown.

or [2] Only the correct factors  $(x + 6)$  and  $(x - 3)$  are shown.

[1] Appropriate work is shown, but more than one computational error is made.

or [1] Only the roots  $-6$  and  $3$  are shown, such as  $x = -6$ ,  $x = 3$ .

or [1]  $y = x^2 + 3x - 18$ , 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

[11] incorrect procedure.

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[12] D

[13] C