

LESSON 2.1 Skills Practice

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**Shape and Structure
Forms of Quadratic Functions****2****Vocabulary**

Write an example for each form of quadratic function and tell whether the form helps determine the x -intercepts, the y -intercept, or the vertex of the graph. Then describe how to determine the concavity of a parabola.

1. Standard form:

2. Factored form:

3. Vertex form:

4. Concavity of a parabola:

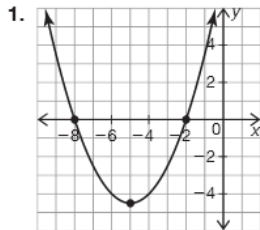
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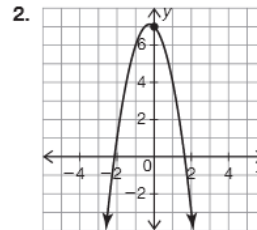
Problem Set

Circle the function that matches each graph. Explain your reasoning.

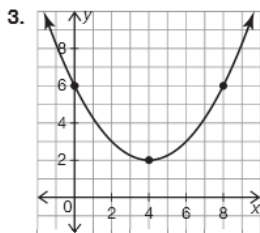


- $f(x) = 6(x - 2)(x - 8)$
- $f(x) = -\frac{1}{2}(x + 2)(x + 8)$
- $f(x) = \frac{1}{2}(x + 2)(x + 8)$
- $f(x) = -\frac{1}{2}(x - 2)(x - 8)$

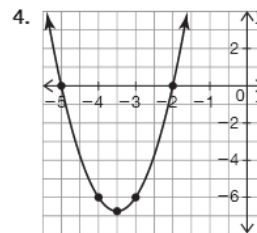
The a -value is positive so the parabola opens up. Also, the roots are at -2 and -8 .



- $f(x) = 2x^2 - x + 7$
- $f(x) = -2x^2 - x + 7$
- $f(x) = -x^2 - 2x + 7$
- $f(x) = -2x^2 - x - 2$



- $f(x) = 0.25(x - 4)^2 - 2$
- $f(x) = 4(x - 2)^2 - 2$
- $f(x) = -0.25(x + 4)^2 + 2$
- $f(x) = 0.25(x - 2)^2 + 4$



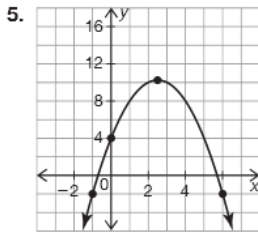
- $f(x) = -3(x + 2)(x - 5)$
- $f(x) = 3(x + 2)(x - 5)$
- $f(x) = 3(x - 2)(x - 5)$
- $f(x) = -3(x - 2)(x - 5)$

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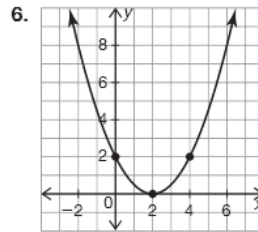
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- $f(x) = x^2 + 5x - 4$
- $f(x) = -x^2 + 5x + 10$
- $f(x) = x^2 + 5x - 4$
- $f(x) = -x^2 + 5x - 4$



- $f(x) = -\frac{1}{2}(x - 2)^2$
- $f(x) = \frac{1}{2}(x - 2)^2 + 2$
- $f(x) = \frac{1}{2}(x - 2)^2$
- $f(x) = -\frac{1}{2}(x + 2)^2$

2

Use the given information to determine the most efficient form you could use to write the quadratic function. Write standard form, factored form, or vertex form.

- 7. vertex (3, 7) and point (1, 10)
vertex form
- 8. points (1, 0), (4, -3), and (7, 0)
- 9. y-intercept (0, 3) and axis of symmetry $x = -\frac{3}{8}$
- 10. points (-1, 12), (5, 12), and (-2, -2)
- 11. roots (-5, 0), (13, 0) and point (-7, 40)
- 12. maximum point (-4, -8) and point (-3, -15)

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Convert each quadratic function in factored form to standard form.

13. $f(x) = (x + 5)(x - 7)$

$f(x) = x^2 - 7x + 5x - 35$

$= x^2 - 2x - 35$

14. $f(x) = (x + 2)(x + 9)$

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15. $f(x) = 2(x - 4)(x + 1)$

16. $f(x) = -3(x - 1)(x - 3)$

17. $f(x) = \frac{1}{3}(x + 6)(x + 3)$

18. $f(x) = -\frac{5}{8}(x - 6)(x + 2)$

Convert each quadratic function in vertex form to standard form.

19. $f(x) = 3(x - 4)^2 + 7$

$f(x) = 3(x^2 - 8x + 16) + 7$

$= 3x^2 - 24x + 55$

20. $f(x) = -2(x + 1)^2 - 5$

21. $f(x) = 2\left(x + \frac{7}{2}\right)^2 - \frac{3}{2}$

22. $f(x) = -(x - 6)^2 + 4$

23. $f(x) = -\frac{1}{2}(x - 10)^2 - 12$

24. $f(x) = \frac{1}{20}(x + 100)^2 + 60$

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Write a quadratic function to represent each situation using the given information.

25. Cory is training his dog, Cocoa, for an agility competition. Cocoa must jump through a hoop in the middle of a course. The center of the hoop is 8 feet from the starting pole. The dog runs from the starting pole for 5 feet, jumps through the hoop, and lands 4 feet from the hoop. When Cocoa is 1 foot from landing, Cory measures that she is 3 feet off the ground. Write a function to represent Cocoa's height in terms of her distance from the starting pole.

$$h(d) = a(d - r_1)(d - r_2)$$

$$3 = a(11 - 5)(11 - 12)$$

$$3 = a(6)(-1)$$

$$3 = -6a$$

$$\frac{3}{-6} = a$$

$$-0.5 = a$$

$$h(d) = -0.5(d - 5)(d - 12)$$

26. Sasha is training her dog, Bingo, to run across an arched ramp, which is in the shape of a parabola. To help Bingo get across the ramp, Sasha places a treat on the ground where the arched ramp begins and one at the top of the ramp. The treat at the top of the ramp is a horizontal distance of 2 feet from the first treat, and Bingo is 6 feet above the ground when he reaches the top of the ramp. Write a function to represent Bingo's height above the ground as he walks across the ramp in terms of his distance from the beginning of the ramp.

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27. Ella's dog, Doug, is performing in a special tricks show. Doug can fling a ball off his nose into a bucket 20 feet away. Ella places the ball on Doug's nose, which is 2 feet off the ground. Doug flings the ball through the air into a bucket sitting on a 4-foot platform. Halfway to the bucket, the ball is 10 feet in the air. Write a function to represent the height of the ball in terms of its distance from Doug.

2

28. A spectator in the crowd throws a treat to one of the dogs in a competition. The spectator throws the treat from the bleachers 19 feet above ground. The treat amazingly flies 30 feet and just barely crosses over a hoop which is 7.5 feet tall. The dog catches the treat 6 feet beyond the hoop when his mouth is 1 foot from the ground. Write a function to represent the height of the treat in terms of its distance.

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29. Hector's dog, Ginger, competes in a waterfowl jump. She jumps from the edge of the water, catches a toy duck at a horizontal distance of 10 feet and a height of 2 feet above the water, and lands in the water at a horizontal distance of 15 feet. Write a function to represent the height of Ginger's jump in terms of her horizontal distance.

2

30. Ping is training her dog, TinTin, to jump across a row of logs. He takes off from a platform that is 7 feet high with a speed of 18 feet per second. Write a function to represent TinTin's height in terms of time as he jumps across the logs.