LESSON 2.5 Skills Practice

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What's the Point?
Deriving Quadratic Functions

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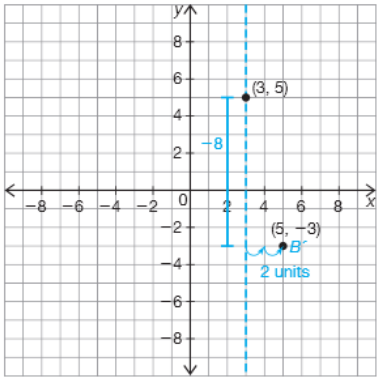
Problem Set

Use your knowledge of reference points to write an equation for the quadratic function that satisfies the given information. Use the graph to help solve each problem.

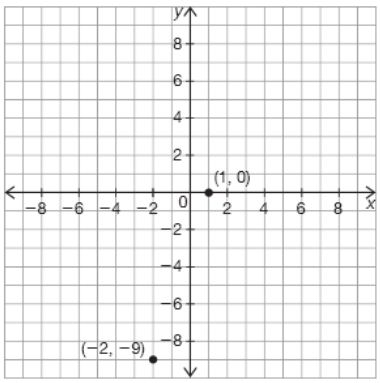
1. Given: vertex (3, 5) and point (5, −3)



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

Point (5, −3) is point B' because it is 2 units from the axis of symmetry. The range between the vertex and point B on the basic function is 4. The range between the vertex and point B' is $4 \times (-2)$, therefore the a-value must be -2.

2. Given: vertex (−2, −9) and one of two x-intercepts (1, 0)



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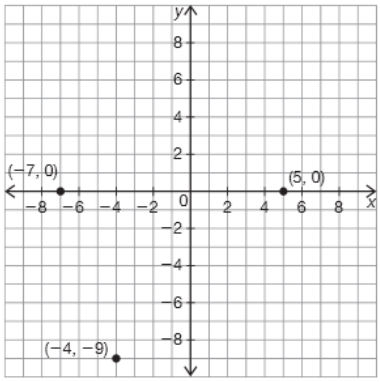
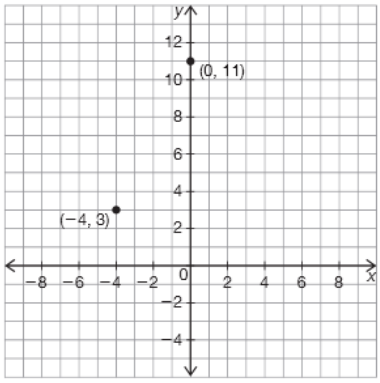
3. Given: two x-intercepts $(-7, 0)$ and $(5, 0)$ and one point $(-4, -9)$



4. Given: vertex $(-4, 3)$ and y-intercept $(0, 11)$



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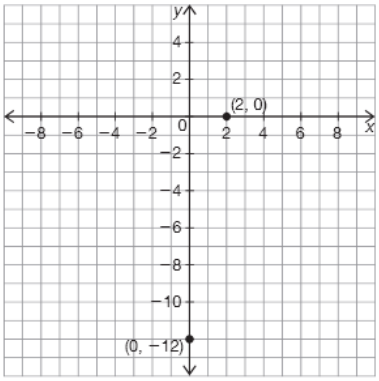
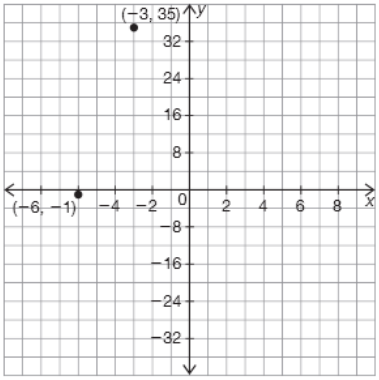
5. Given: exactly one x-intercept (2, 0) and y-intercept (0, −12)



6. Given: vertex (−6, −1) and point (−3, 35)



Use a graphing calculator to determine the quadratic equation for each set of three points that lie on a parabola.

7. (−4, 12), (−2, −14), (2, 6)

$f(x) = 3x^2 + 5x - 16$

8. (5, −56), (1, −4), (−10, −26)

9. (−8, 8), (−4, 6), (4, 38)

10. (−2, 3), (2, −9), (5, −60)

11. (0, 3), (−5, −2.4), (15, −7.8)

12. (−2, 13), (1, −17), (7, 31)

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Create a system of equations and use algebra to write a quadratic equation for each set of three points that lie on a parabola.

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13. (−3, 12), (0, 9), (3, 24)

Equation 1: $12 = 9a - 3b + c$

Equation 2: $9 = c$

Equation 3: $24 = 9a + 3b + c$

Substitute equation 2 into equation 1 and solve for a.

$12 = 9a - 3b + 9$

$3 = 9a - 3b$

$3 + 3b = 9a$

$a = \frac{1}{3} + \frac{1}{3}b$

Substitute the value for a in terms of b and the value for c into equation 3 and solve for b.

$24 = 9\left(\frac{1}{3} + \frac{1}{3}b\right) + 3b + 9$

$24 = 3 + 3b + 3b + 9$

$15 = 3 + 6b$

$12 = 6b$

$b = 2$

Substitute the values for b and c into equation 1 and solve for a.

$12 = 9a - 3(2) + 9$

$15 = 9a + 3$

$9 = 9a$

$a = 1$

Substitute the values for a, b, and c into a quadratic equation in standard form.

$f(x) = x^2 + 2x + 9$

14. (−2, −2), (1, −5), (2, −18)

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15. (2, 9), (0, −5), (−10, −15)

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16. (−1, 2), (4, 27), (−3, 20)

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17. (5, −6), (−2, 8), (3, 4)

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18. (1, 17), (−1, −9), (2, 105)

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