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Precalculus
Summer Math Study Guide

After you have practiced the skills on Khan Academy (list available on bdcs.org/summer2019/read), complete the following study guide. Be sure to show all work and describe your reasoning, as this study guide should be a resource for you at the beginning of the school year. If you have any questions, be sure to contact me at gpinkerton@bdcs.org. I will reply within 48 hours Monday-Friday.

Quadratics by Factoring (Intro)
Solve.

1. $x^2 + 16x - 36 = 0$

2. $x^2 - 11x + 18 = 0$

Quadratics by Factoring
Solve.

3. $5x^2 + 60x + 180 = 0$

4. $3x^2 - 54x + 243 = 0$

Factor Quadratics by Grouping
Rewrite each expression as the product of two binomials.

5. $7x^2 + 24x + 9$

6. $8x^2 + 15x - 2$

Quadratics by Taking Square Roots: Strategy
Solve.

7. $\frac{1}{3}(x+4)^2 = 48$

8. $5(x-2)^2 + 6 = 86$

Quadratic Formula
Solve.

9. $-6x - 1 + 5x^2 = 8x^2$

10. $10 = -4x + 3x^2$

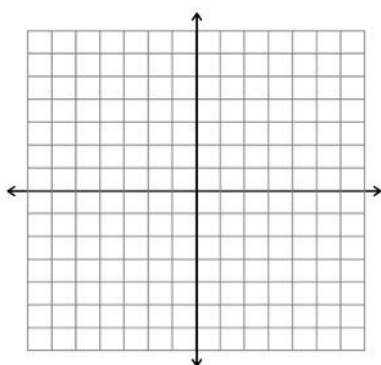**Solve Quadratic Equations: Complex Solutions**
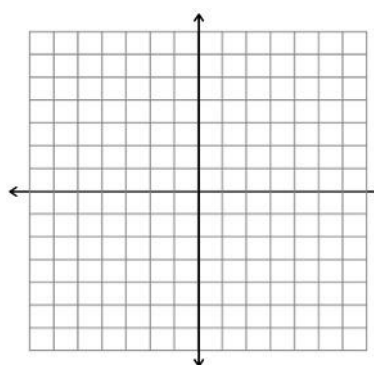Solve.

11. $9x^2 - x - 3 = 0$

12. $3x^2 - 6x + 11 = 0$

Graph Quadratics: Vertex Form

Graph the functions below. Show at least three points.

13. $y = (x + 2)^2 - 5$
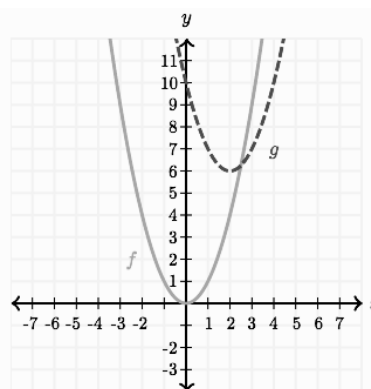
14. $y = -2(x - 4)^2 + 6$

Shift Parabolas

Describe the transformations of each parabola from the parent function $f(x) = x^2$.

15. $g(x) = (x + 9)^2 - 3$

16.

Features of Quadratic Functions: Strategy

Consider the three equivalent functions below and fill in the blanks with the appropriate letter.

A. $f(x) = -\frac{1}{2}(x + 3)^2 + \frac{25}{2}$ _____ 17. Which form most quickly reveals the *y*-intercept?

B. $f(x) = -\frac{1}{2}x^2 - 3x + 8$ _____ 18. Which form most quickly reveals the vertex?

C. $f(x) = -\frac{1}{2}(x - 2)(x + 8)$ _____ 19. Which form most quickly reveals the zeros?
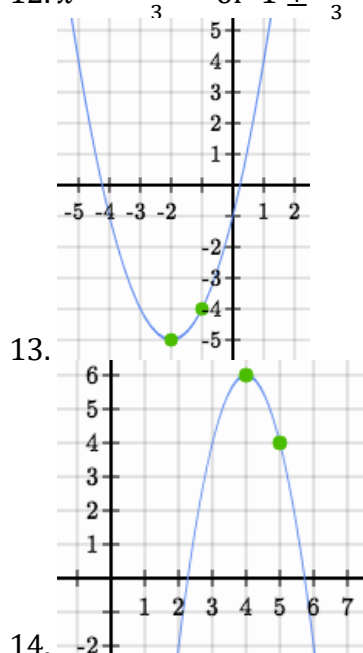
Features of Quadratic Functions

For the functions below, give (A) the zeros of the function and (B) the coordinates of the vertex.

20. $f(x) = (x - 5)^2 - 36$

21. $f(x) = x^2 - 2x - 8$

Answer Key

1. $x = \{-18, 2\}$
2. $x = \{2, 9\}$
3. $x = -6$
4. $x = 9$
5. $(7x + 3)(x + 3)$
6. $(8x - 1)(x + 2)$
7. $x = \{-16, 8\}$
8. $x = \{-2, 6\}$
9. $x = \dfrac{-3 \pm \sqrt{6}}{3}$
10. $x = \dfrac{2 \pm \sqrt{34}}{3}$
11. $x = \dfrac{1 \pm \sqrt{109}}{18}$
12. $x = \dfrac{3 \pm 2i\sqrt{6}}{3}$ or $1 \pm \dfrac{2\sqrt{6}}{3}i$

13.

14.

15. The function is shifted to the left nine units and down three units
16. The function is shifted to the right two units and up six units
17. B – standard form
18. A – vertex form
19. C – factored form
20. Zeros: $x = \{-1, 11\}$, Vertex: $(5, 36)$
21. Zeros: $x = \{-2, 4\}$, Vertex: $(1, -9)$