Name _____ Period _____

5.1A *Solving Quadratic Equations by Graphing*

1. What does "find the zeros of the function" mean?

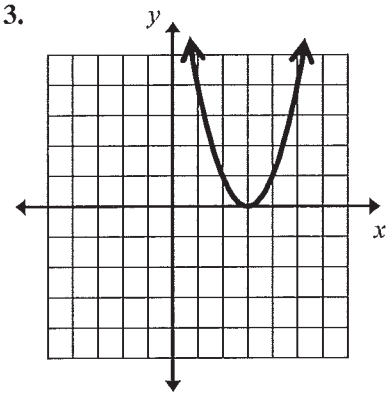
To find the x-value(s) that make the function $f(x) = 0$.

2. When you are solving a quadratic equation by graphing, what do you look for on the graph?

The x-intercepts

#3 – 5: Determine whether the quadratic functions have two real roots, one real root, or no real roots. If possible, list the zeros of the function.

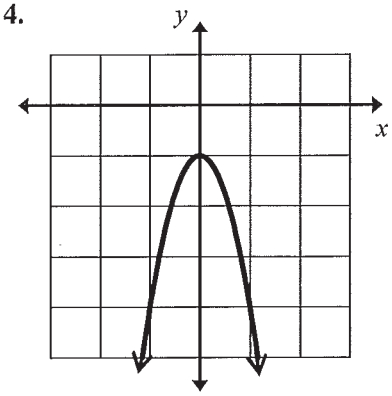
3.



Number and type of roots: 1 real root

Zeros: $x = 3$

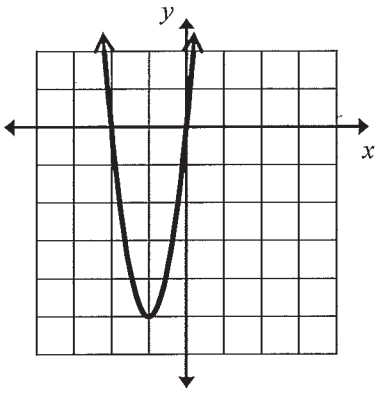
4.



Number and type of roots: no real roots

Zeros: none

5.

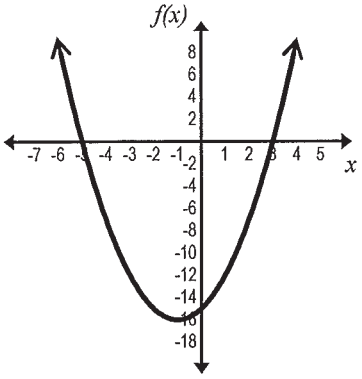


Number and type of roots: 2 real roots

Zeros: $x = 0$ or $x = -2$

#6 – 7: Use the graph to find the zeros of the following quadratic functions. Check that the solutions work.

6. $f(x) = x^2 + 2x - 15$

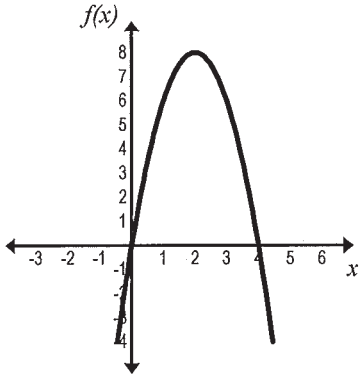


Solution(s): $x = 3$ or $x = -5$

Check: $f(3) = (3)^2 + 2(3) - 15 = 9 + 6 - 15 = 0$ ✓

$f(-5) = (-5)^2 + 2(-5) - 15 = 25 - 10 - 15 = 0$ ✓

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



Solution(s): $x = 0$ or $x = 4$

Check: $f(0) = -2(0)^2 + 8(0) = 0 + 0 = 0$ ✓

$f(4) = -2(4)^2 + 8(4) = -32 + 32 = 0$ ✓

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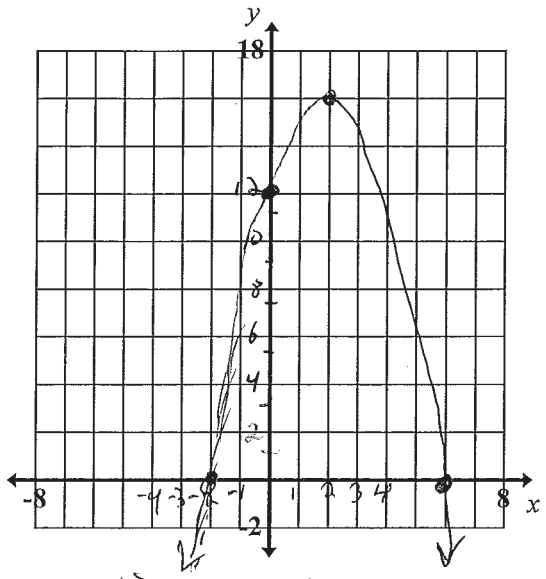
5.1A *Solving Quadratic Equations by Graphing*

#8 – 9: Graph each of the following quadratic functions and use the graph to find the zeros. Create a table of values if necessary. Verify that the values truly are solutions.

8. $f(x) = -x^2 + 4x + 12$

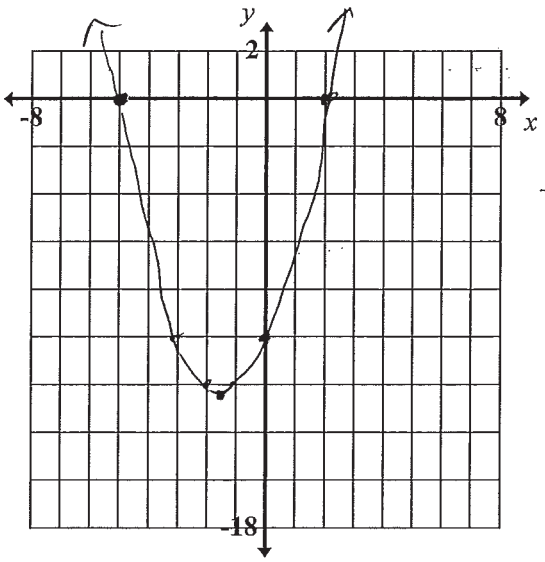


Solution(s): $x = -2, 6$

Verify: $f(-2) = -(-2)^2 + 4(-2) + 12$
$= -(4) + -8 + 12$
$= -4 + -8 + 12$
$f(-2) = 0$

$f(6) = -(6)^2 + 4(6) + 12$
$f(6) = -36 + 24 + 12 = 0$

9. $f(x) = x^2 + 3x - 10$



x	y
-3	-10
-2	-12
-1	-12
0	-10
1	-6
2	0
3	8

Solution(s): $x = -5, 2$

Verify: $f(-5) = (-5)^2 + 3(-5) - 10$
$= 25 + -15 - 10 = 0$

$f(2) = (2)^2 + 3(2) - 10$
$= 4 + 6 - 10$
$f(2) = 0$

#10 – 15: Use your graphing calculator to solve each equation by graphing. If needed, round your answer to the nearest hundredth. Question #13 – 15, verify that the values truly are solutions. *

10. $x^2 - 7x = 11$
$x^2 - 7x - 11 = 0$

Solution(s): $x = -1.32, 8.32$

11. $6x^2 = -19x - 15$
$6x^2 + 19x + 15 = 0$

Solution(s): $x = -1.6, -1.5$

12. $5x^2 - 7x - 3 = 8$
$5x^2 - 7x - 11 = 0$

Solution(s): $x = -0.94, 2.34$

13. $\frac{1}{2}x^2 - x = 8$
$\frac{1}{2}x^2 - x - 8 = 0$

Solution(s): $x = -3.12, 5.12$

Verify: $.5(-3.12)^2 - (-3.12) - 8 \approx 0$ *
$.5(5.12)^2 - (5.12) - 8 \approx 0$

14. $x^2 + 4x = 6$
$x^2 + 4x - 6 = 0$

Solution(s): $x = -5.16, 1.16$

Verify: $(-5.16)^2 + 4(-5.16) = 5.99 \approx 6$ ✓
$(1.16)^2 + 4(1.16) = 5.99 \approx 6$ ✓

15. $2x^2 - 2x - 5 = 0$

Solution(s): $x = -1.16, 2.16$

Verify: $2(-1.16)^2 - 2(-1.16) - 5 = .01 \approx 0$
$2(2.16)^2 - 2(2.16) - 5 = .01 \approx 0$

* since x values were rounded

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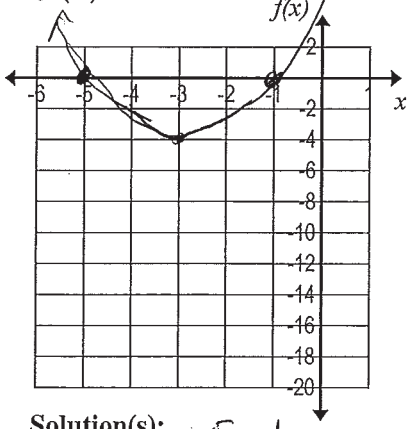
5.1A *Solving Quadratic Equations by Graphing*

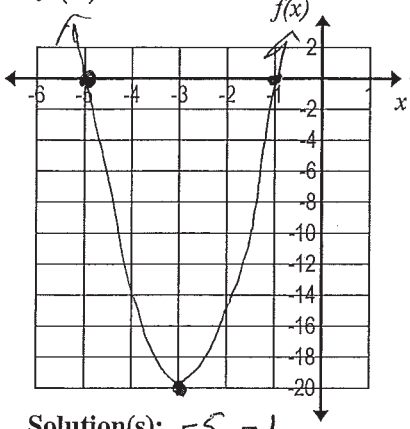
#16 – 18: Use a graphing utility to graph the following functions. Draw the graph of the function. Use the graphing utility to approximate the zeros to the nearest tenth.

16. $f(x) = x^2 + 6x + 5$



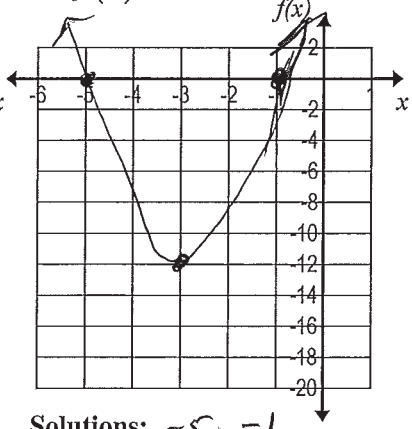
Solution(s): $-5, -1$

17. $f(x) = 5x^2 + 30x + 25$



Solution(s): $-5, -1$

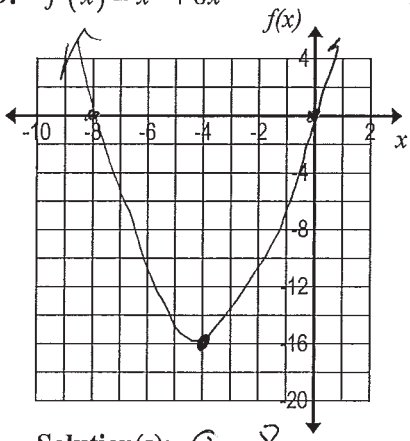
18. $f(x) = 3x^2 + 18x + 15$



Solutions: $-5, -1$

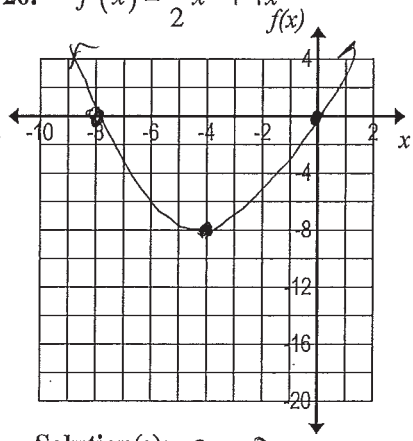
#19 – 21: Use a graphing utility to graph the following functions. Draw the graph of the function. Use the graphing utility to approximate the zeros to the nearest tenth.

19. $f(x) = x^2 + 8x$



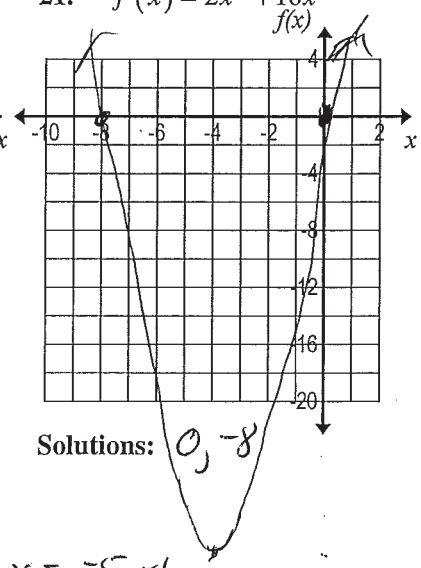
Solution(s): $0, -8$

20. $f(x) = \frac{1}{2}x^2 + 4x$



Solution(s): $0, -8$

21. $f(x) = 2x^2 + 16x$



Solutions: $0, -8$

22. Investigation:

a) Looking to Question #16 – 18, record the following:

- Function in #16 $f(x) = x^2 + 6x + 5$ Solutions in #16 $x = -5, -1$
- Function in #17 $f(x) = 5x^2 + 30x + 25$ Solutions in #17 $x = -5, -1$
- Function in #18 $f(x) = 3x^2 + 18x + 15$ Solutions in #18 $x = -5, -1$

b) Looking to Question #19 – 21, record the following:

- Function in #19 $f(x) = x^2 + 8x$ Solutions in #19 $x = 0, -8$
- Function in #20 $f(x) = \frac{1}{2}x^2 + 4x$ Solutions in #20 $x = 0, -8$
- Function in #21 $f(x) = 2x^2 + 16x$ Solutions in #21 $x = 0, -8$

c) Comparing the functions in questions 16, 17, and 18, and then again in 19, 20, and 21, write a conjecture about the relationship of the functions within each set of questions and the solutions of those functions.

If one function is a multiple of another function, then they will have the same solutions.

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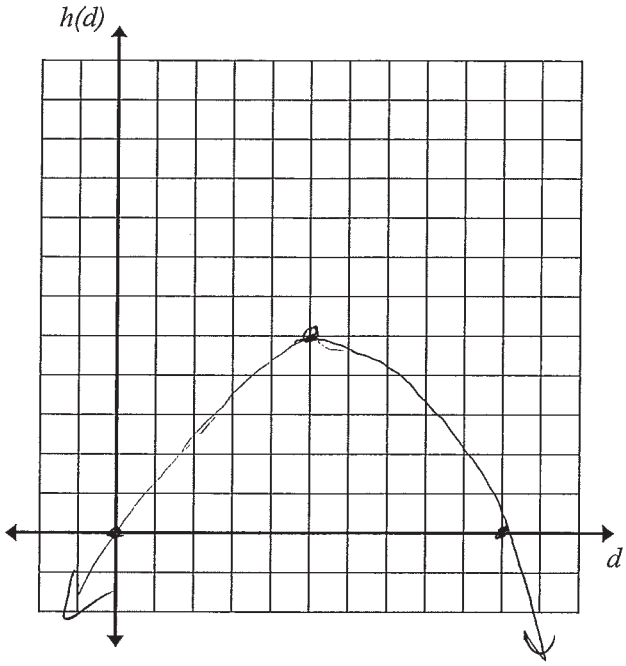
5.1A *Solving Quadratic Equations by Graphing*

23. A bottlenose dolphin jumps out of the water. The path the dolphin travels can be modeled by the function $h(d) = -0.2d^2 + 2d$, where h represents the height, in feet, of the dolphin and d represents the horizontal distance, in feet, the dolphin traveled.

a) Sketch a graph of the quadratic equation.



b) What is the maximum height the dolphin reaches? Where is this represented on the graph of the function? 5 ft; the vertex

c) What is the horizontal distance that the dolphin jumps? Where is this represented on the graph of the function? 10 ft; the x intercept > 0

Section 5.1A