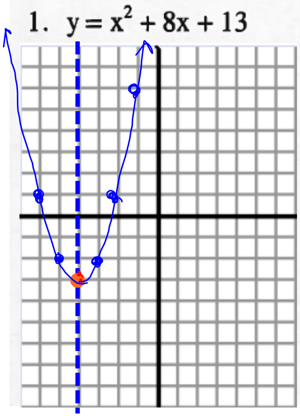
Homework Review p. 97

1. $y = x^2 + 8x + 13$



$x = \frac{-(8)}{2(1)} = \frac{-8}{2} = -4$

$y = (-4)^2 + 8(-4) + 13$

$16 - 32 + 13$

$-16 + 13$

-3

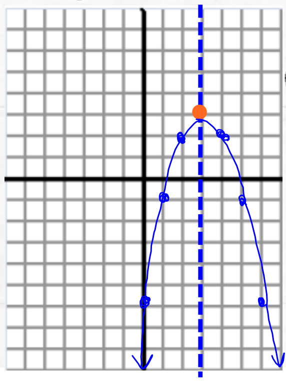
vertex: $(-4, -3)$

Axis of symmetry: x = - 4

D: All Reals

R: $y \geq -3$

2. $y = -x^2 + 6x - 6$



$x = \frac{-(6)}{2(-1)} = \frac{-6}{-2} = 3$

$y = -(3)^2 + 6(3) - 6$

$-(9) + 18 - 6$

$9 - 6$

3

vertex: $(3, 3)$

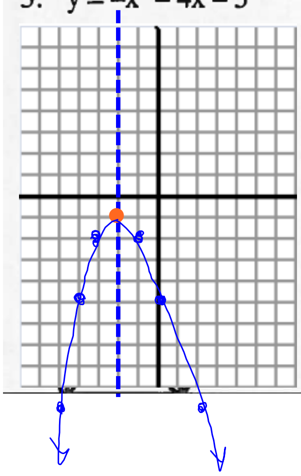
Axis of symmetry: x = 3

D: All Reals

R: $y \leq 3$

$x = \frac{-b}{2a}$

3. $y = -x^2 - 4x - 5$



$x = \frac{-(-4)}{2(-1)} = \frac{4}{-2} = -2$

$y = -(-2)^2 - 4(-2) - 5$

$-(4) + 8 - 5$

$4 - 5$

-1

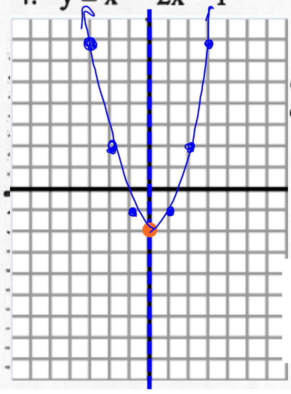
vertex: $(-2, -1)$

Axis of symmetry: x = -2

D: All Reals

R: $y \leq -1$

4. $y = x^2 - 2x - 1$



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

$y = (1)^2 - 2(1) - 1$

$1 - 2 - 1$

$-1 - 1$

-2

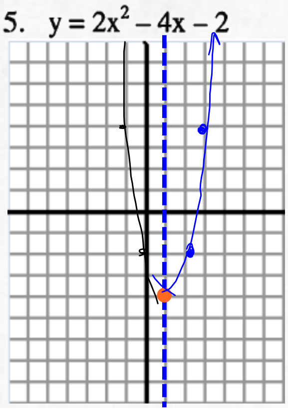
vertex: $(1, -2)$

Axis of symmetry: x = 1

D: All Reals

R: $y \geq -2$

5. $y = 2x^2 - 4x - 2$



$x = \frac{-(-4)}{2(2)} = \frac{4}{4} = 1$

$y = 2(1)^2 - 4(1) - 2$

$2(1) - 4 - 2$

$2 - 4 - 2$

$-2 - 2$

-4

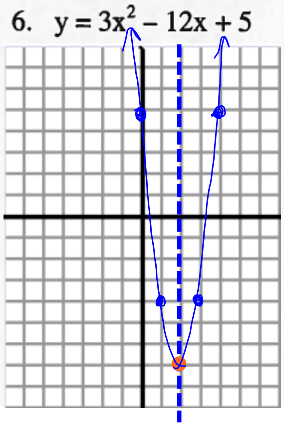
vertex: $(1, -4)$

Axis of symmetry: x = 1

D: All Reals

R: $y \geq -4$

6. $y = 3x^2 - 12x + 5$



$x = \frac{-(-12)}{2(3)} = \frac{12}{6} = 2$

$y = 3(2)^2 - 12(2) + 5$

$3(4) - 24 + 5$

$12 - 24 + 5$

$-12 + 5$

-7

vertex: $(2, -7)$

Axis of symmetry: x = 2

D: All Reals

R: $y \geq -7$

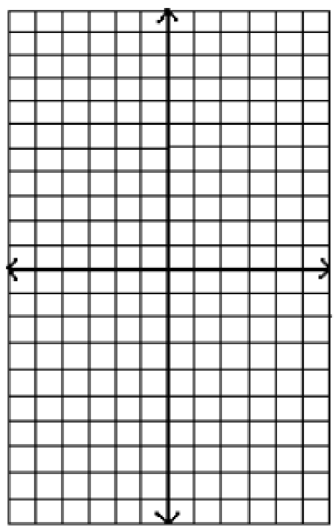
Example 1 : Graphing $y = ax^2 + bx + c$ **(Putting it all together to graph)**

Use all of the shortcuts you have learned to graph the quadratic function:

$$y = 2x^2 + 8x + 5$$

Step 1: Find the axis of symmetry.

Step 2: Substitute x-value to find y.



Step 3: Plot the $2x^2$ pattern from vertex.

Step 4: Check the y-intercept for accuracy and then draw the parabola.

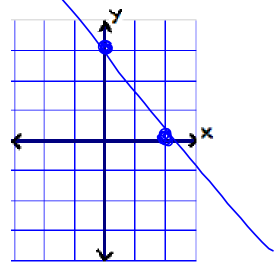
page 173 WARM UP

10–4 Solving Quadratic Equations in the form $y=ax^2+c$

<u>Review/Connecting to Linear Equations:</u>
Recall how to find x and y-intercepts in linear equations.

Where are the x and y-intercepts for $3x + 2y = 6$? Graph the linear equation .

x	y	
0	3	← y-int
2	0	← x-int



Example 1 : Using Square Roots to Solve a Quadratic Equation

When we solve a quadratic equation, we use the same technique as with linear equations. We substitute zero in for y, and solve for x.

Given $\boxed{y = x^2 - 4}$, find the x-intercepts both by graphing and by solving for x.

Step 1: substitute y = 0

Step 2: isolate the squared term

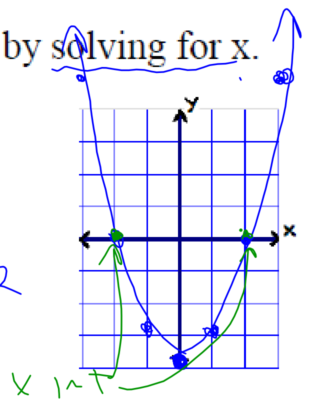
Step 3: take the square root of b.s.

(include the $\pm$)

$x^2 - 4 = 0$

$\sqrt{x^2} = \sqrt{4}$

$x = \pm 2$



What do you notice about the solutions and the x-intercepts? the solutions and intercepts are the same.

For this reason the x-intercepts are often called the "roots" of the quadratic.

√ Understanding Check:

Solve each equation or say "no solution":

a. $t^2 - 25 = 0$

$t^2 = 25$

$t = \pm 5$

b. $3n^2 - 12 = 0$

$3n^2 = 12$

$n^2 = 4$

$n = \pm 2$

c. $2g^2 + 32 = 0$

$2g^2 = -32$

$\sqrt{g^2} = \sqrt{-16}$

no solution

√ Understanding Check:

Solve each equation or say "no solution":

a. $t^2 - 2\cancel{5} = 0$

$\quad +\cancel{2}5 \quad +25$

$t^2 = 25$

$\boxed{t = \pm 5}$

$\boxed{(5,0) \text{ and } (-5,0)}$

b. $3n^2 - 1\cancel{2} = 0$

$\quad +\cancel{12} + 12$

$\frac{\cancel{3}n^2}{\cancel{3}} = \frac{12}{3}$

$n^2 = 4$

$\boxed{n = \pm 2}$

$\boxed{(2,0) \text{ and } (-2,0)}$

c. $2g^2 + 3\cancel{2} = 0$

$\quad -\cancel{32} \quad -32$

$\frac{\cancel{2}g^2}{\cancel{2}} = \frac{-32}{2}$

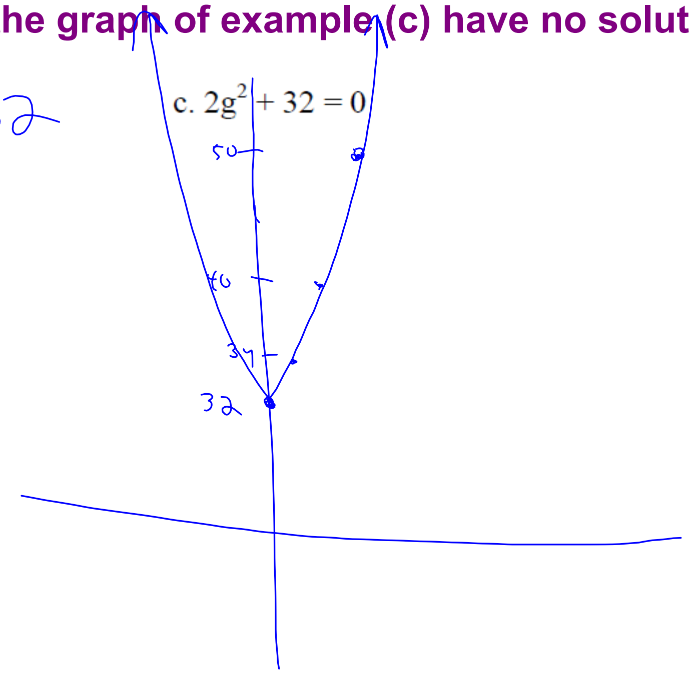
$g^2 = -16$

$\boxed{\text{No solutions}}$

Why does the graph of example (c) have no solutions?

c. $2g^2 + 32 = 0$

$y = 2g^2 + 32$



√ Understanding Check Continued:

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d. $\frac{1}{2}m^2 + 3 = 21$

$\frac{1}{2}m^2 = 18$

$m^2 = 36$

$m = \pm 6$

e. $-5x^2 - 4 = -49$

$-5x^2 = -45$

$x^2 = 9$

$x = \pm 3$

f. $2x^2 + 3x^2 - 2 = 3$

$5x^2 = 5$

$\sqrt{x^2} = \sqrt{1}$

$x = \pm 1$

g. $4(2x^2 + 5) = 412$

$8x^2 + 20 = 412$

$8x^2 = 392$

$x^2 = 49$

$x = \pm 7$

h. $8x^2 - 18 = 3x^2 + 2$

$5x^2 = 20$

$x^2 = 4$

$x = \pm 2$

Understanding Check Solutions:

d. $\frac{1}{2}m^2 + \cancel{3} = 21$

$-\cancel{3} \quad -3$

$(2)\ \frac{1}{2}m^2 = 18\ (2)$

$m^2 = 36$

$\boxed{m = \pm 6}$

e. $-5x^2 - \cancel{4} = -49$

$+\cancel{4} \quad +4$

$\frac{-5x^2}{-5} = \frac{-45}{-5}$

$x^2 = 9$

$\boxed{x = \pm 3}$

f. $2x^2 + 3x^2 - 2 = 3$

$+2$

$5x^2$

$\frac{5x^2}{5} = \frac{5}{5}$

$x^2 = 1$

$\boxed{x = \pm 1}$

g. $4(2x^2 + 5) = 412$

$8x^2 + 20 = 412$

-20

$\frac{8x^2}{8} = \frac{392}{8}$

$x^2 = 49$

$\boxed{x = \pm 7}$

h. $8x^2 - 18 = 3x^2 + 2$

$-3x^2 \quad +18$

$\frac{5x^2}{5} = \frac{20}{5}$

$x^2 = 4$

$\boxed{x = \pm 2}$

Example 2: Quadratic Equations Without Perfect Square Answers

Solve by isolating the variable, give each answer as positive and negative with the symbol $\pm$

$$2x^2 - 100 = 0$$

Step 1: Add 100 to both sides.

Step 2: Divide both sides by two.

Step 3: Square root both sides.

Step 4: Give the answer as a simplified radical.

√ Understanding Check:

Solve each equation.

a $-5x^2 + 4 = -96$

$-5x^2 = -100$

$x^2 = 20$

$x = \pm\sqrt{20}$

$x = \pm 2\sqrt{5}$

b. $3x^2 - 5 = 13$

$3x^2 = 18$

$\sqrt{x^2} = \pm\sqrt{6}$

$x = \pm\sqrt{6}$

c. $2x^2 + 7 = 73$

$2x^2 = 66$

$x^2 = 33$

$x = \pm\sqrt{33}$

$x = \frac{-b}{2a}$

Station #2

Use the y-intercept, the axis of symmetry, and the vertex to graph each of the following quadratics.

a. $y = 1x^2 + 4x + 3$ b. $y = 2x^2 + 4x - 5$ c. $y = -x^2 - 4x + 4$

$x = \frac{-4}{2} = -2$

$y = (-2)^2 + 4(-2) + 3$

$y = 4 - 8 + 3$

$y = -1$

Vertex: $(-2, -1)$

$$-x^2 = -20$$
$$x^2 = 20$$

Understanding Check Solutions

a $-5x^2 + \cancel{4} = -96$

$\cancel{-4} \quad -4$

$\frac{\cancel{-5}x^2}{\cancel{-5}} = \frac{-100}{-5}$

$\sqrt{x^2} = \sqrt{20}$

$x = \sqrt{20}$

$\sqrt{4} \quad \sqrt{5}$

$\boxed{x = \pm 2\sqrt{5}}$

b. $3x^2 - \cancel{5} = 13$

$\cancel{+5} \quad +5$

$\frac{\cancel{3}x^2}{\cancel{3}} = \frac{18}{3}$

$\sqrt{x^2} = \sqrt{6}$

$\boxed{x = \pm\sqrt{6}}$

c. $2x^2 + \cancel{7} = 73$

$\cancel{-7} \quad -7$

$\frac{\cancel{2}x^2}{\cancel{2}} = \frac{66}{2}$

$\sqrt{x^2} = \sqrt{33}$

$\boxed{x = \pm\sqrt{33}}$

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