Bellwork: Find the vertex and x-intercepts of the function

$x^2 - 6x + 9 - 9 - 7$ $\quad f(x) = x^2 - 6x - 7$ $\quad f(x) = (x-7)(x+1)$

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

$x: (7,0) \quad (-1,0)$

$v: (3, -16)$

$\times$	$x - 3$	
x	x^2	$-3x$
-3	$-3x$	$+9$

Homework 4.3 Solutions

$(x-8)(x+5) = 0 \rightarrow \{-5, 8\}$

1. $\dfrac{3 \pm \sqrt{3^2 + 4(40)}}{2} = \dfrac{3 \pm \sqrt{169}}{2} = \dfrac{3 \pm 13}{2} = \dfrac{16}{2} or \dfrac{-10}{2} \rightarrow \{-5, 8\}$

$(3x+2)(x-5) = 0 \rightarrow \left\{-\dfrac{2}{3}, 5\right\}$

2. $\dfrac{13 \pm \sqrt{13^2 + 4(3)(10)}}{2(3)} = \dfrac{13 \pm \sqrt{289}}{6} = \dfrac{13 \pm 17}{6} = \dfrac{30}{6} or \dfrac{-4}{6} \rightarrow \left\{-\dfrac{2}{3}, 5\right\}$

3. $\left\{4 \pm 3\sqrt{2}\right\}$

4. $\left\{1 \pm i\sqrt{6}\right\}$

5. $\left\{\dfrac{-10 \pm \sqrt{82}}{6}\right\}$

6. $\left\{-3 \pm 2\sqrt{6}\right\}$

7. $\left\{\dfrac{-1 \pm \sqrt{6}}{2}\right\}$

8. $\left\{\dfrac{1 \pm i}{3}\right\}$

9. $\left\{-1 \pm \sqrt{3}\right\}$

10. $\left\{2 \pm 2\sqrt{6}\right\}$

11. $\left\{\dfrac{-1 \pm \sqrt{83}}{2}\right\}$

12. $\{\pm 11i\}$

13. $\left\{\pm 2i\sqrt{2}\right\}$

14. $\left\{\dfrac{1 \pm i\sqrt{11}}{6}\right\}$

15. $(-2, -17)$

16. $(4, 35)$

17. $(0, -13)$

18. $\left(-\dfrac{5}{2}, -\dfrac{75}{4}\right)$

19. $\left(-2 + \sqrt{17}, 0\right)\left(-2 - \sqrt{17}, 0\right)$

20.
  A. Max height = 215 ft. @ 3.5 sec.
  B. $\dfrac{14 + \sqrt{215}}{4} \approx 7.17$ sec.

★21. $x^2 - 10x - 3 = 0$ (or any version of that equation multiplied by a constant.)

5) $6x^2 + 20x + 3 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-20 \pm \sqrt{(20)^2 - 4(6)(3)}}{2(6)}$$

$$x = \frac{-20 \pm \sqrt{328}}{12}$$

82
$4 \quad 41$
$2 \quad 2$

$$x = \frac{-20 \pm 2\sqrt{82}}{12}$$

$$\boxed{x = \frac{-10 \pm \sqrt{82}}{6}}$$

20) $h(t) = -16t^2 + 112t + 19$

a. $\left(\frac{-b}{2a}\right.$

$$\frac{-112}{2(-16)} = 3.5$$

$(3.5, 215)$

$\boxed{215 ft}$
3.5 sec

$$\frac{-\sqrt{b^2-4ac}}{2a} \qquad \frac{-b}{2a} \qquad \frac{+\sqrt{b^2-4ac}}{2a}$$
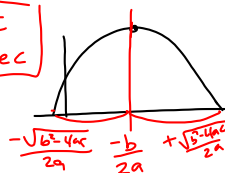
b) $0 = -16t^2 + 112t + 19$

$$x = \frac{-112 \pm \sqrt{(112)^2 - 4(-16)(19)}}{2(-16)}$$

$$\frac{-b \pm}{2a}$$

$$x = \frac{-112 \pm \sqrt{13760}}{-32} \qquad \frac{-112 \pm 117.3}{-32}$$

$$\frac{-112 + 117.3}{-32} \qquad \frac{-112 - 117.3}{-32}$$
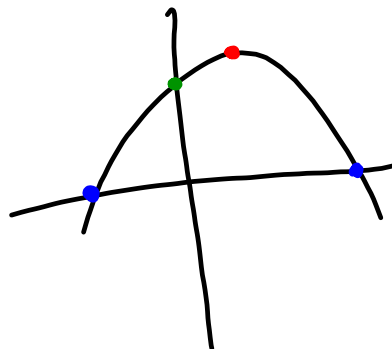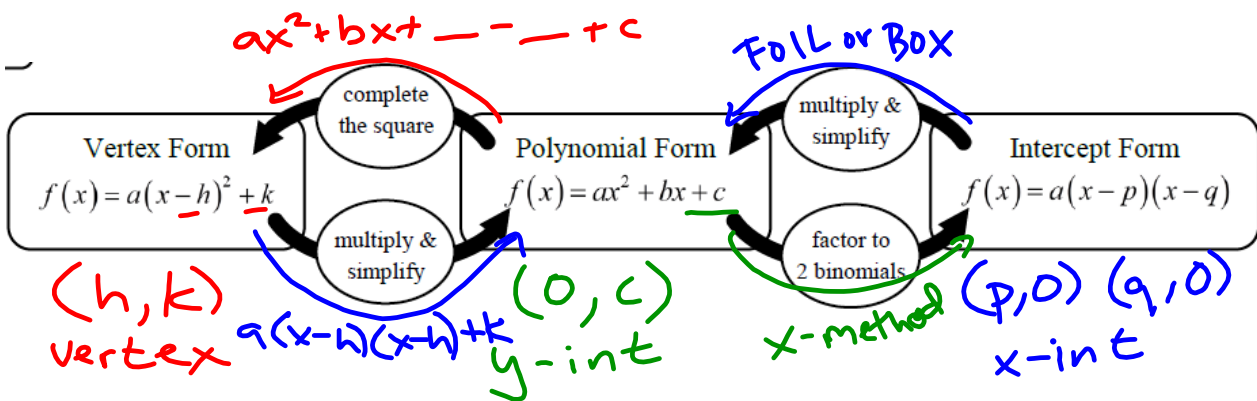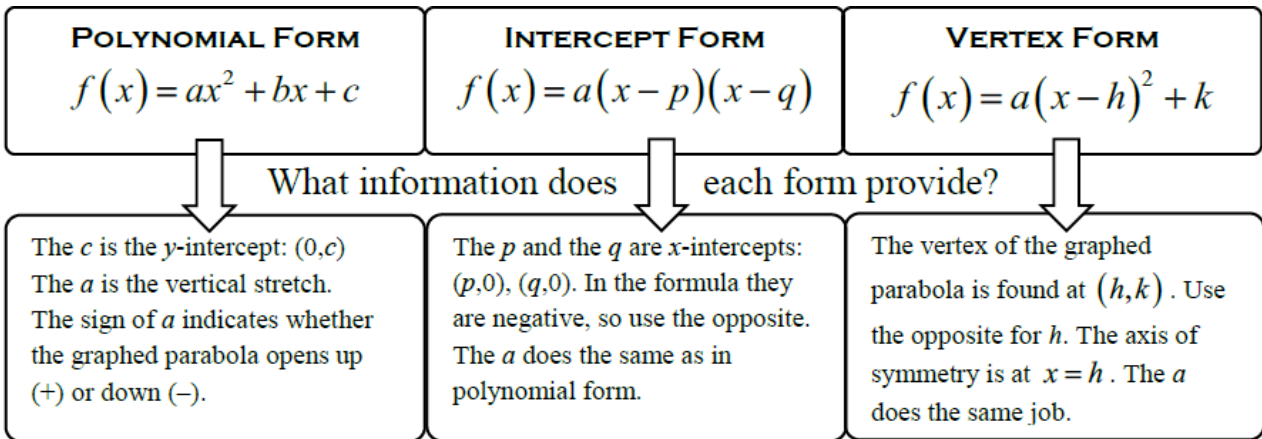
$$-0.2 \qquad \boxed{7.2 \text{ sec}}$$

Today's Objectives:

I can graph and write quadratic functions and identify key features

POLYNOMIAL FORM	INTERCEPT FORM	VERTEX FORM
$f(x) = ax^2 + bx + c$	$f(x) = a(x-p)(x-q)$	$f(x) = a(x-h)^2 + k$

What information does   each form provide?

The c is the y-intercept: $(0,c)$. The a is the vertical stretch. The sign of a indicates whether the graphed parabola opens up $(+)$ or down $(-)$.	The p and the q are x-intercepts: $(p,0)$, $(q,0)$. In the formula they are negative, so use the opposite. The a does the same as in polynomial form.	The vertex of the graphed parabola is found at (h,k). Use the opposite for h. The axis of symmetry is at $x = h$. The a does the same job.

$ax^2 + bx + \_\_ \_\_ \_\_ + c$ FOIL or BOX

Vertex Form	complete the square	Polynomial Form	multiply & simplify	Intercept Form
$f(x) = a(x-h)^2 + k$	multiply & simplify	$f(x) = ax^2 + bx + c$	factor to 2 binomials	$f(x) = a(x-p)(x-q)$

(h,k)
vertex $a(x-h)(x-h)+k$ $(0,c)$
y-int   x-method $(p,0)$ $(q,0)$
x-int

Write each function in the two forms other than what's given.
Identify key features: x- & y-intercepts, vertex, axis of symmetry.

A. $f(x) = x^2 + 8x - 9$

2. $f(x) = (x+9)(x-1)$

$x^2 + 8x + \underline{16} - \underline{16} - 9$

3.
$f(x) = (x+4)^2 - 25$

y-int: $(0,-9)$
x-int: $(-9,0)$ $(1,0)$
vertex: $(-4,-25)$
Symmetry: $x = -4$

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

$-2(x+4)(x+4) + 8$

$-2(x^2 + 8x + 16) + 8$
$-2x^2 - 16x - 32 + 8$

$f(x) = -2x^2 - 16x - 24$
$-2(x^2 + 8x + 12)$
$f(x) = -2(x+6)(x+2)$

X: $(-6,0)(-2,0)$
V: $(-4,8)$ y: $(0,-24)$
aos: $x = -4$

C. $f(x) = (x+3)(x-5)$

×	x^2	$3x$
-5	$-5x$	-15

X: $(-3,0)(5,0)$

$f(x) = x^2 - 2x - 15$

$x^2 - 2x + \underline{1} - \underline{1} - 15$
$(x-1)^2 - 16$

y: $(0,-15)$

$f(x) = (x-1)^2 - 16$

V: $(1,-16)$
aos: $x = 1$

WRITING QUADRATIC FUNCTIONS

GIVEN A VERTEX, OR *X*-INTERCEPTS　Use the appropriate form and plug in the given values.

PASSING THROUGH A GIVEN POINT　This is usually given so that you can find the value of a. Substitute the given coordinates (x, y) for x and $f(x)$ respectively. Then solve for a.

CLUES FROM A GRAPH　If the graph shows clearly a vertex or *x*-intercepts, use them. You can also find a on a graph; it is the vertical change in the graph one unit to the right of the vertex.

2. Write a quadratic function with vertex at $(-5, 7)$ and passing through $(1, 25)$.

$$f(x) = \tfrac{1}{2}(x+5)^2 + 7$$

$$y = a(x+5)^2 + 7$$

$$25 = a(1+5)^2 + 7$$

$$25 = 36a + 7$$
$$-7 \qquad -7$$

$$a = \tfrac{1}{2}$$

$$\frac{18}{36} = \frac{36a}{36}$$

3. Write a quadratic function with x-intercepts at $(1, 0)$ and $(9, 0)$, passing through $(3, 12)$.

$$f(x) = -(x-1)(x-9)$$

$$y = a(x-1)(x-9)$$

$$12 = a(3-1)(3-9)$$

$$12 = a(2)(-6)$$

$$\frac{12}{-12} = \frac{-12a}{-12}$$

$$a = -1$$

7)

x	y
-2	0
-1	-7
0	-12
1	-15
2	-16
3	-15

$$y = (x-2)^2 - 16$$

V: ⟨2 -16⟩ +1

+1

$$a = 1$$