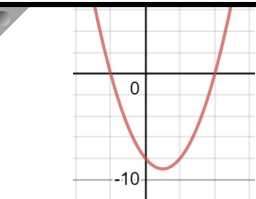
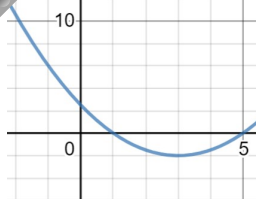
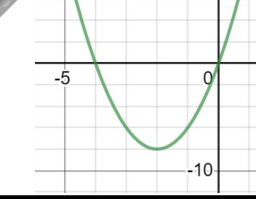
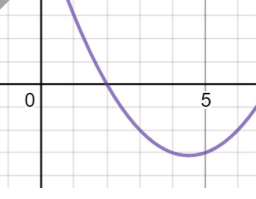
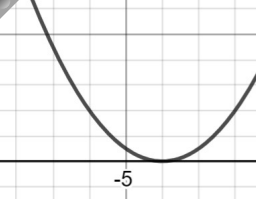
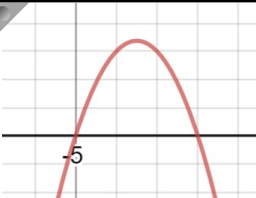


3.6 Factored Form

Investigate: Graph the given equations on Desmos and complete the chart.

Equation	x-int.	equation of the axis of symmetry	vertex	sketch
$y = (x - 4)(x + 2)$	$(-2, 0)$ $(4, 0)$	$x = 1$	$(1, -9)$	
$y = 0.5(x - 5)(x - 1)$	$(1, 0)$ $(5, 0)$	$x = 3$	$(3, -2)$	
$y = 2x(x + 4)$	$(0, 0)$ $(-4, 0)$	$x = -2$	$(-2, -8)$	
$y = (x - 2)(x - 7)$	$(2, 0)$ $(7, 0)$	$x = \frac{9}{2}$	$(4.5, -6.25)$	
$y = (x + 4)(x + 4)$	$(-4, 0)$	$x = -4$	$(-4, 0)$	
$y = -3(x + 2)(x + 5)$	$(-2, 0)$ $(-5, 0)$	$x = -\frac{7}{2}$	$(-3.5, 6.75)$	

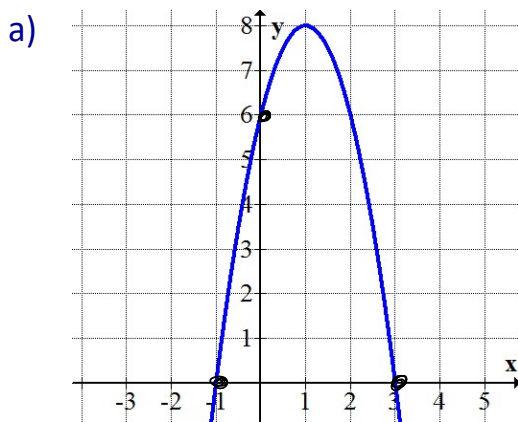
Summary:

$$y = a(x - r)(x - s)$$

same "a" as vertex form

- represents an equation in FACTORED form
- the x-intercepts, or zeros, are r and s
- the axis of symmetry is between the x-intercepts $x = \frac{r+s}{2}$
- the x-coordinate of the vertex is the value of the axis of symmetry
- find the y-coordinate of the vertex by substituting the x-coordinate of the vertex in the equation

Ex. 1 Determine the equation of the parabola in factored form.
Algebraically determine the value of 'a'.



Zeros: $-1, 3$

$$y = a(x+1)(x-3)$$

Sub $(0, 6)$

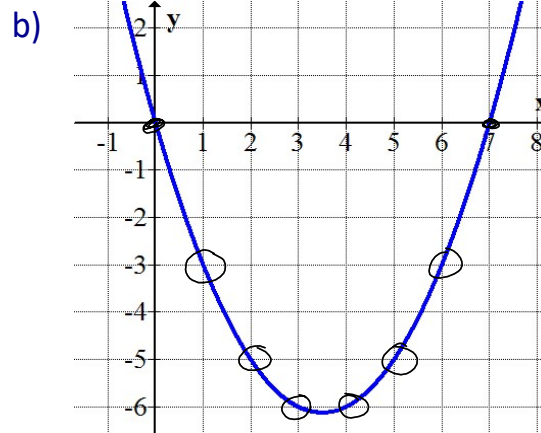
$$6 = a(0+1)(0-3)$$

$$6 = a(1)(-3)$$

$$6 = -3a$$

$$-2 = a$$

$$\therefore y = -2(x+1)(x-3)$$



Zeros: $0, 7$

$$y = a(x-0)(x-7)$$

Sub $(1, -3)$

$$-3 = a(1)(1-7)$$

$$-3 = a(1)(-6)$$

$$-3 = -6a$$

$$\frac{3}{6} = a$$

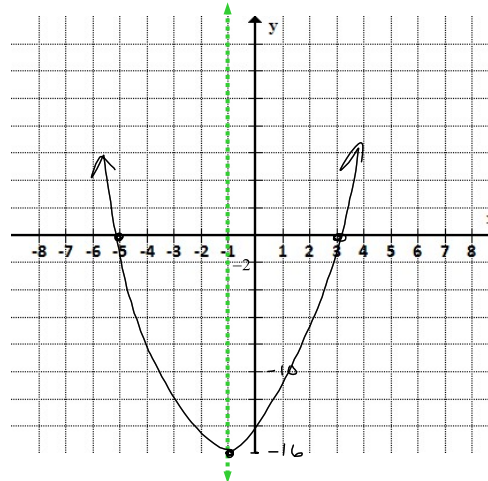
$$\frac{1}{2} = a$$

$$\therefore y = \frac{1}{2}(x)(x-7)$$

Ex. 2 Sketch each parabola. Label the x-intercepts and the vertex.

a) $y = (x-3)(x+5)$
 AOS
 zeroes: 3, -5
 $x = \frac{3+(-5)}{2}$
 $= -1$

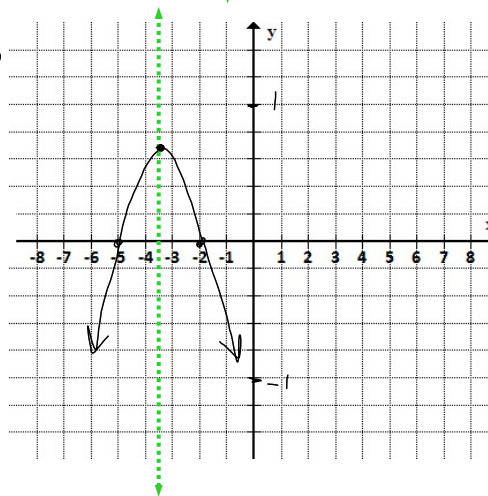
Find y of vertex
 Sub in $x = -1$
 $y = (-1-3)(-1+5)$
 $= (-4)(4)$
 $= -16$
 \therefore Vertex $(-1, -16)$



Graph

b) $y = -0.3(x+2)(x+5)$
 AOS
 zeroes: -2, -5
 $x = \frac{-2+(-5)}{2}$
 $= -3.5$

Sub in $x = -3.5$
 $y = -0.3(-3.5+2)(-3.5+5)$
 $= -0.3(-1.5)(1.5)$
 $= 0.675$
 \therefore Vertex $(-3.5, 0.675)$

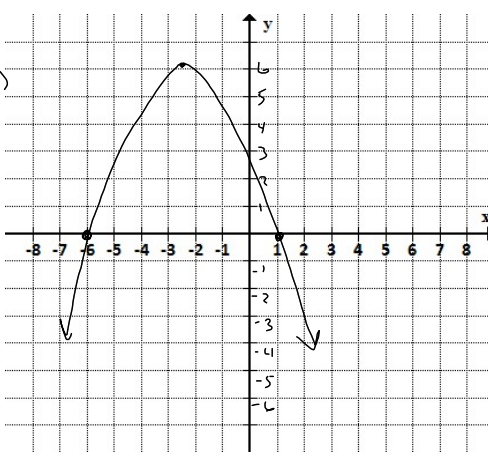


Graph

c) $y = -\frac{1}{2}(x-1)(x+6)$
 AOS
 zeroes: 1, -6
 $x = \frac{1+(-6)}{2}$
 $= -\frac{5}{2}$

Sub in $x = -\frac{5}{2}$
 $y = -\frac{1}{2}\left(-\frac{5}{2}-1\right)\left(-\frac{5}{2}+6\right)$
 $= -\frac{1}{2}\left(-\frac{5}{2}-\frac{2}{2}\right)\left(-\frac{5}{2}+\frac{12}{2}\right)$
 $= -\frac{1}{2}\left(-\frac{7}{2}\right)\left(\frac{7}{2}\right)$
 $= \frac{49}{8}$
 \therefore $\left(-\frac{5}{2}, \frac{49}{8}\right)$

-2.5, 6.125



Graph

Ex. 3 Chris kicked a ball from the ground. It travelled a horizontal distance of 52 m and reached a maximum height of 17 m.

a) Draw a sketch of the relation between horizontal distance and height.

$$\text{AOS? } x = \frac{0+52}{2} = 26$$

b) Determine the equation of the relation in **factored form**.

$$y = a(x-r)(x-s)$$

Zeros: 0, 52

$$y = a(x)(x-52)$$

Sub in (26, 17)

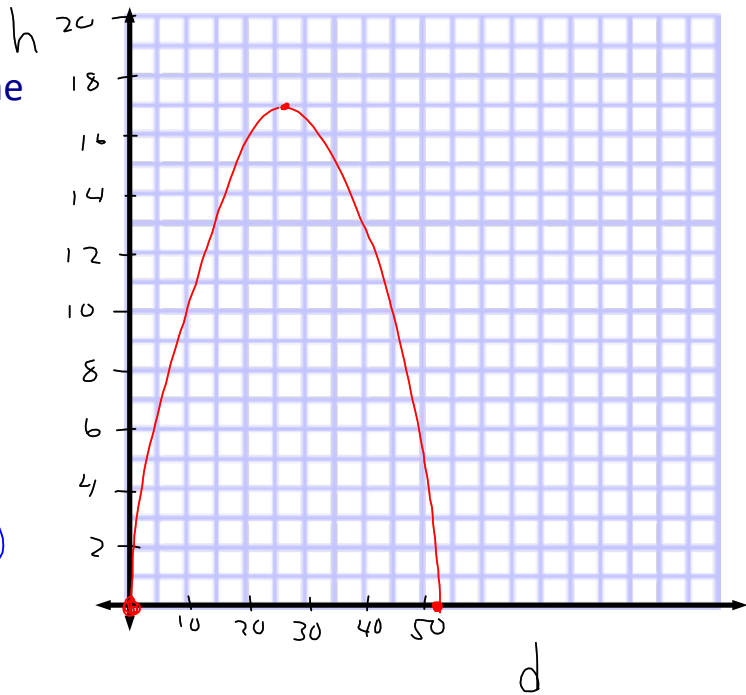
$$17 = a(26)(26-52)$$

$$17 = a(26)(-26)$$

$$17 = a(-676)$$

$$a = \frac{-17}{676}$$

$$\therefore y = -\frac{17}{676}x(x-52)$$



Homework

p.192 #3,4,5,7,8,10,11