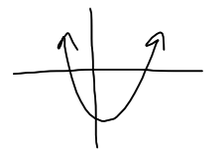
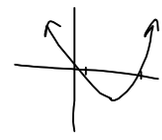
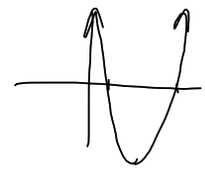
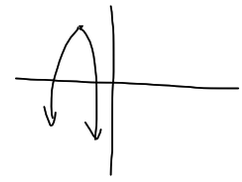
3.6 Factored Form

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)	(5, 0) (1, 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)	$x = 4.5$	(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)	$x = -3.5$	(-3.5, 6.75)	

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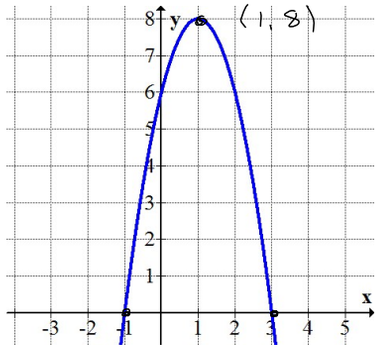
Summary: $y = a(x - r)(x - s)$

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'.

a)



Zeroes: $-1, 3$

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

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

Sub in $(1, 8)$

$8 = a(1+1)(1-3)$

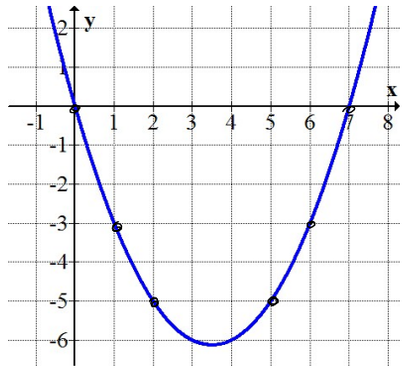
$8 = a(2)(-2)$

$8 = a(-4)$

$-2 = a$

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

b)



Zeros: $0, 7$

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

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

$y = ax(x-7)$

Sub in $(2, -5)$ { Any point on the curve other than zeroes!

$-5 = a(2)(2-7)$

$-5 = a(2)(-5)$

$\frac{-5}{-5} = 2a$

$1 = 2a$

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

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

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

a) $y=(x-3)(x+5)$

x-ints: 3, -5

AOS

$x=\frac{3+(-5)}{2}$

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

$=-1$

y of vertex?

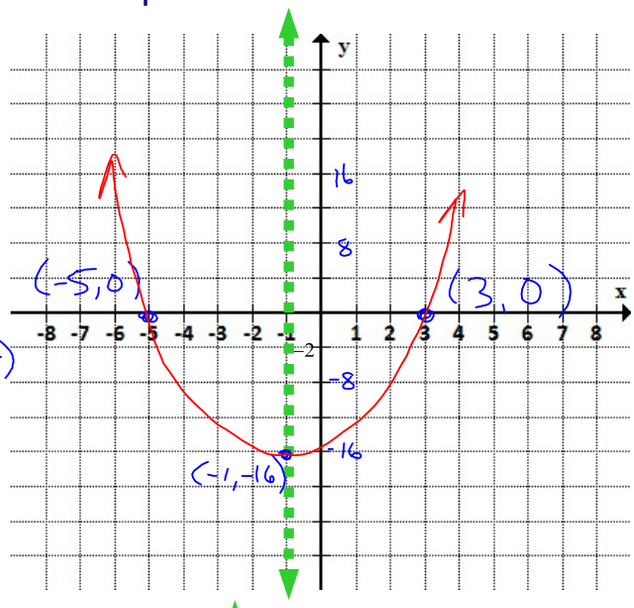
sub $x=-1$

$y=(-1-3)(-1+5)$

$=(-4)(4)$

$=-16$

$\therefore (-1,-16)$



b) $y=-\frac{1}{2}(x-1)(x+6)$

x-ints: 1, -6

AOS

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

$=\frac{-5}{2}$

y of vertex?

sub in $x=-\frac{5}{2}$

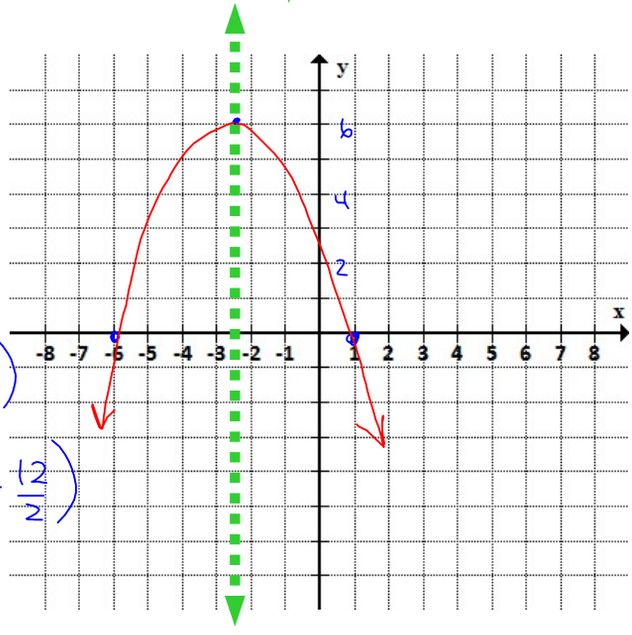
$y=-\frac{1}{2}\left(-\frac{5}{2}-1\right)\left(-\frac{5}{2}+6\right)$

$=-\frac{1}{2}\left(-\frac{5}{2}-\frac{2}{2}\right)\left(-\frac{5}{2}+\frac{12}{2}\right)$

$=-\frac{1}{2}\left(-\frac{7}{2}\right)\left(\frac{7}{2}\right)$

$=\frac{49}{8}$

$\therefore V\left(-\frac{5}{2},\frac{49}{8}\right)$

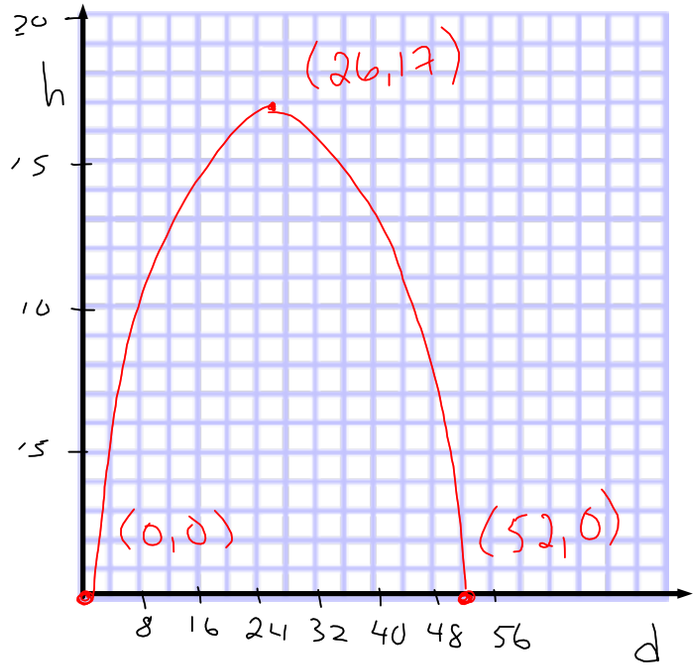


$-\frac{5}{2}=-2.5$ $\frac{49}{8}=6.125$

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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.



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

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

x-ints: 0, 52 & (26, 17)

$y = a(x-0)(x-52)$

$y = ax(x-52)$

Sub in (26, 17)

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

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

$17 = a(-676)$

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

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

Homework

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