

### 3.10 Real World Problem Solving using Graphing and Factoring

#### ZEROS WARMUP

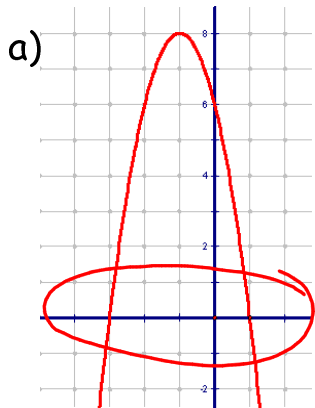
We use several words to describe the x - intercepts of Quadratics:

- x intercepts
  - Solution
  - Roots
- AND
- Zeros

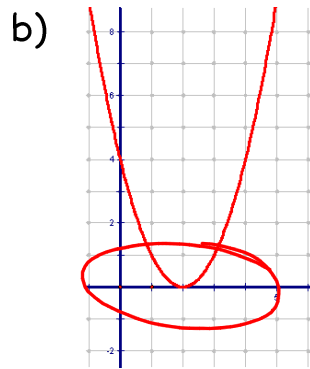
They all mean the same thing !!!!

the point where curve crosses x axis

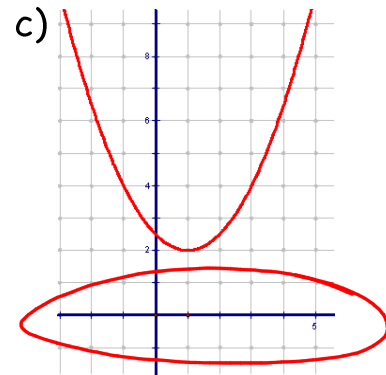
Ex 1: Given the graph, state the x intercepts of each of the quadratic function



Zeros: 1 & -3



Solution: 2



Roots: NONE

Ex 2: Given the equation, state the x intercepts of each of the quadratic function

$$y=3(x+2)(x-5)$$

$$x = -2 \text{ & } x = 5$$

## VERTEX WARMUP

### Ex 1: Find the vertex

a) Given an equation in vertex form

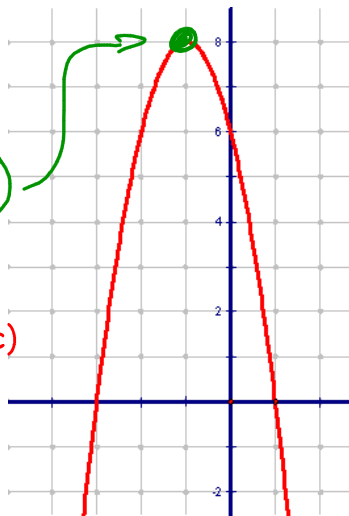
$$y = -5(x-2)^2 + 4$$

Vertex (2, 4)

b) Given a graph

Vertex (-1, 8)

Notice the vertex falls  
halfway between the zeros  
(hint: remember this for part c)



c) Given an equation in factored form

$$y = (x+2)(x-4)$$

①  $x = -2$  &  $x = 4$

③ Sub in to equation  
 $x = 1$

② Axis =  $\frac{-2+4}{2}$

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

$$y = (3)(-3)$$

$$y = -9$$

$$= 1$$

V (1, -9)

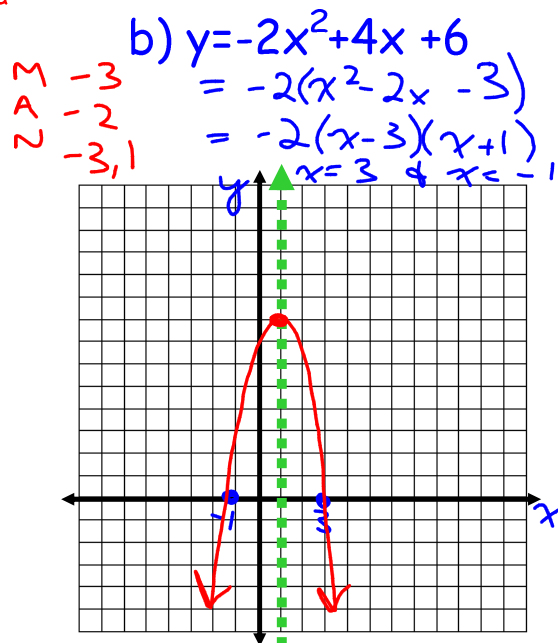
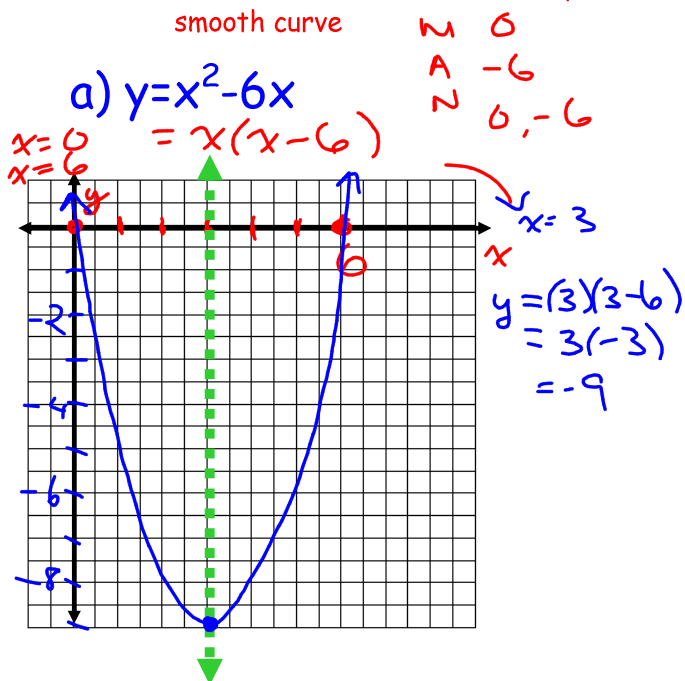
## Graphing from Factored Form

Ex. Graph each of the following parabolas using three points  
(vertex and two zeros)

Remember a parabola is always symmetrical

Steps

1. Find Zeros by factoring
2. Find vertex (halfway between Zeros)
3. Plot vertex and zeros connect points with a smooth curve



$y = -2(1 - 3)(1 + 1)$   
 $y = -2(-2)(2)$   
 $y = 8$

Real World Problem:

**Ex1.** A canon is shot from a cliff. The relation  $h = -5t^2 + 20t + 150$  is a model that gives the height of the canon ball,  $h$ , in metres, at  $t$  seconds after it is shot.



a) From what height is the canon shot?

y-int!  $h = 160m$

Picture it...



b) When does the canon ball hit the ground?

$$\begin{aligned} h &= -5t^2 + 20t + 160 \\ &= -5(t^2 - 4t - 32) \\ &= -5(t-8)(t+4) \end{aligned}$$

M -32  
A -4  
N -8,4

$t = 8s$  or  $t = -4s$

c) When does the canon ball reach its maximum height? What is its maximum height?

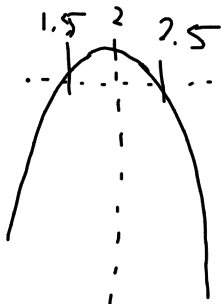
Need Vertex!  
Axis of Symm =  $\frac{8 + (-4)}{2} = 2$

Sub in  $t=2$   
 $h = -5(2-8)(2+4)$   
 $= -5(-6)(6)$   
 $= 180$   
 $V(2, 180)$

$\therefore$  Ball reaches a height of 180m at 2s

d) What is the height of the 1.5 seconds after it is shot? When is it at that height again?

$h = -5(t-8)(t+4)$  <sup>canon ball</sup>  
 $h = -5(1.5-8)(1.5+4)$   
 $h = 178.75$



$\therefore$   $h$  is 178.75 and will happen again at 2.5s

# Homework:

1. Real world Handout

2. page. 272

Graph # 3b, 4c,5a

Do # 8ab, 9, 10, 11