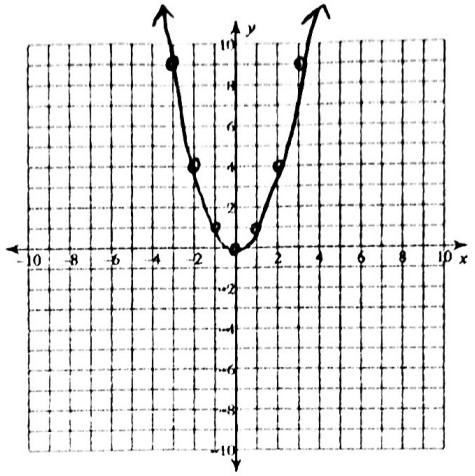
5.2 Graphing Basics

1) For the equations below, fill out the table and graph the points.

a. $y = x^2$

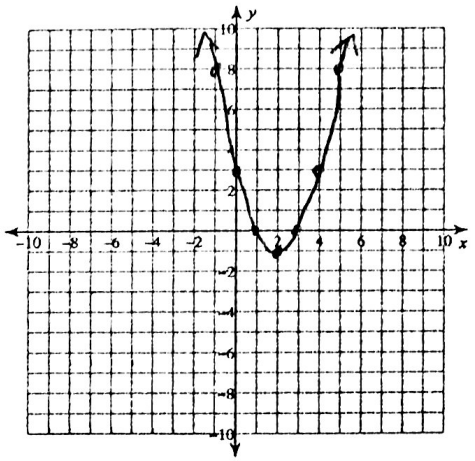
Rate of Change

x	y	
−3	9	
		→ −5
−2	4	
		→ −3
−1	1	
		→ −1
0	0	
		→ +1
1	1	
		→ +3
2	4	
		→ +5
3	9	



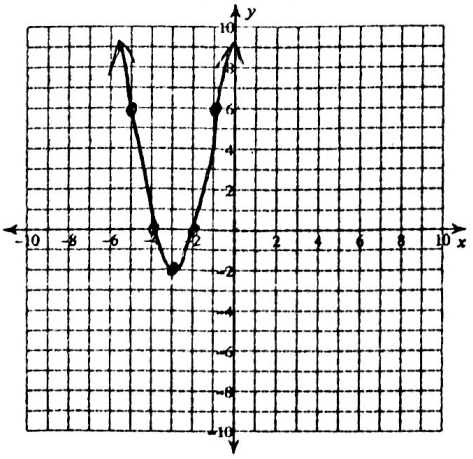
b. $y = x^2 - 4x + 3$

x	y	
−1	8	
		→ −5
0	3	
		→ −3
1	0	
		→ −1
2	−1	
		→ +1
3	0	
		→ +3
4	3	
		→ +5
5	8	



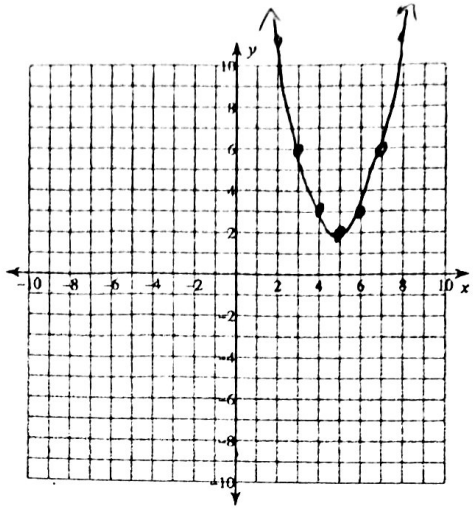
c. $y = 2x^2 + 12x + 16$

x	y	
−6	16	
		→ −10
−5	6	
		→ −6
−4	0	
		→ −2
−3	−2	
		→ +2
−2	0	
		→ +6
−1	6	
		→ +10
0	16	



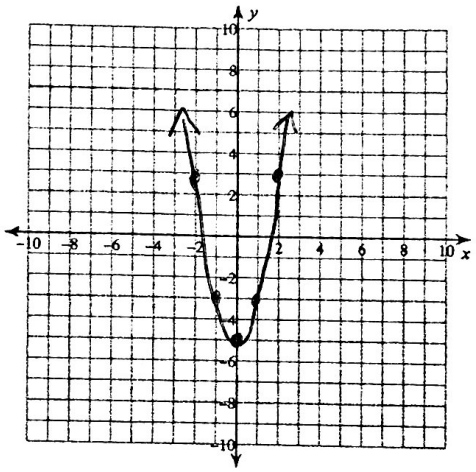
d. $y = x^2 - 10x + 27$

x	y	
2	11	$\rangle -5$
3	6	$\rangle -3$
4	3	$\rangle -1$
5	2	$\rangle +1$
6	3	$\rangle 3$
7	6	$\rangle 5$
8	11	



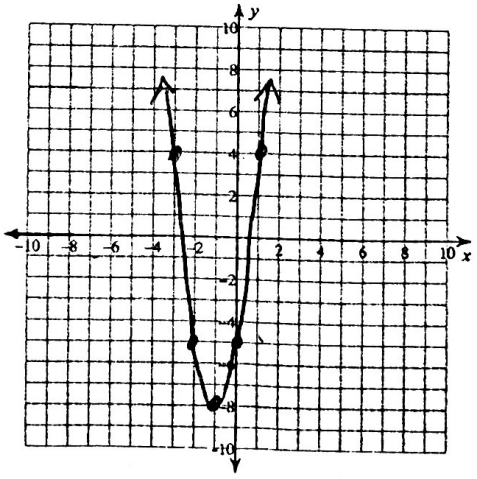
e. $y = 2x^2 - 5$

x	y	
−3	13	$\rangle -10$
−2	3	$\rangle -6$
−1	−3	$\rangle -2$
0	−5	$\rangle +2$
1	−3	$\rangle +6$
2	3	$\rangle +10$
3	13	



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

x	y	
−4	19	$\rangle -15$
−3	4	$\rangle -9$
−2	−5	$\rangle -3$
−1	−8	$\rangle +3$
0	−5	$\rangle +9$
1	4	$\rangle +15$
2	19	



2) For the tables that you filled out, make an additional column for the rate of change. Pick out the rate of change for each table.

3) Which equations had the same rate of change? What in the equation do you think determines what the rate of change will be?

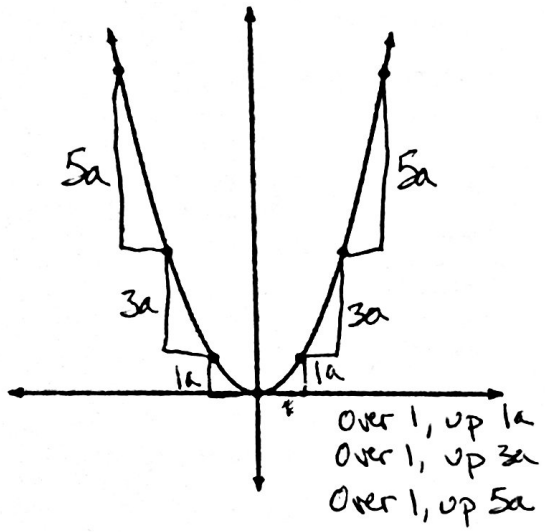
a, b, d The number in front of x^2

c, e

4) What point do you feel is the "center" of the rate of change?

Vertex

We are going to use this exploration as a guide to graphing:



In order to graph a parabola, you only need two things:

Vertex

a-value (# in front of x^2)

$y = ax^2 + bx + c$

8) Given the equation and the vertex, graph each quadratic. Then identify each key feature.

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

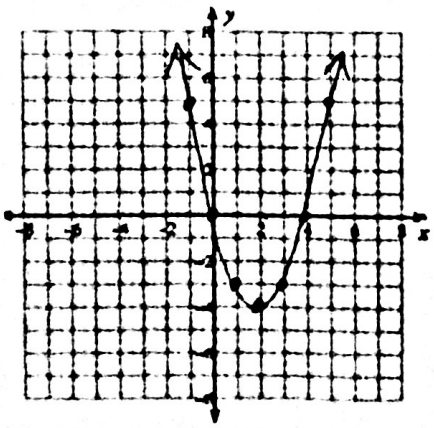
Vertex: (2, −4)

$a = 1$

$1a = 1(1) = 1$

$3a = 3(1) = 3$

$5a = 5(1) = 5$



x-intercept(s): (0,0), (4,0)

y-intercept: (0,0)

Axis of Symmetry: $x = 2$

Vertex: (2, −4)

Max/min value: −4

Value of x that maximizes function: 2

Domain: $(-\infty, \infty)$

Range: $[-4, \infty)$

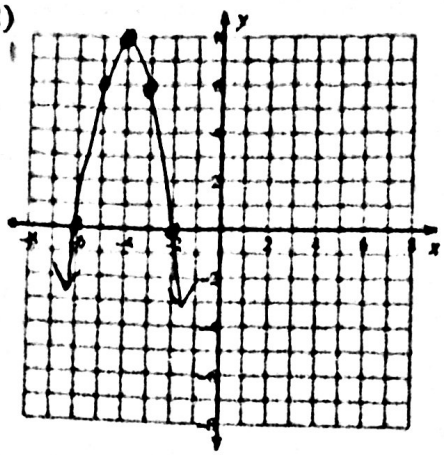
Increasing: $(2, \infty)$

Decreasing: $(-\infty, 2)$

b. $y = -2(x+6)(x+2)$
Vertex: $(-4,8)$

$a = -2$

$1a = 1(-2) = -2$
$3a = 3(-2) = -6$
$5a = 5(-2) = -10$

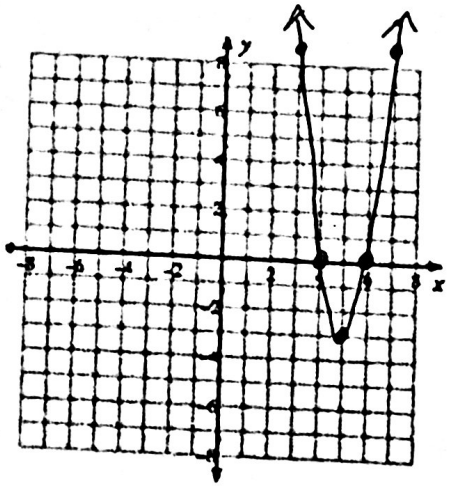


x-intercept(s): $(-6,0)$, $(-2,0)$
y-intercept: ~~Off~~ graph
Axis of Symmetry: $x = -4$
Vertex: $(-4, 8)$
Max/min value: 8
Value of x that maximizes function: -4
Domain: $(-\infty, \infty)$
Range: $(-\infty, 8]$
Increasing: $(-\infty, -4)$
Decreasing: $(-4, \infty)$

c. $y = 3(x-5)^2 - 3$
Vertex: $(5, -3)$

$a = 3$

$1a = 1(3) = 3$
$3a = 3(3) = 9$
$5a = 5(3) = 15$

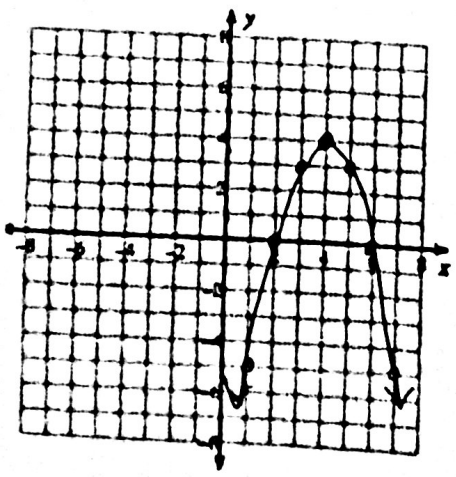


x-intercept(s): $(4,0)$, $(6,0)$
y-intercept: ~~Off~~ graph
Axis of Symmetry: $x = 5$
Vertex: $(5, -3)$
Max/min value: -3
Value of x that maximizes function: 5
Domain: $(-\infty, \infty)$
Range: $[-3, \infty)$
Increasing: $(5, \infty)$
Decreasing: $(-\infty, 5)$

d. $y = -x^2 + 8x - 12$
Vertex: $(4,4)$

$a = -1$

$1a = -1$
$3a = -3$
$5a = -5$



x-intercept(s): $(2,0)$, $(6,0)$
y-intercept: $(0, -12)$
Axis of Symmetry: $x = 4$
Vertex: $(4,4)$
Max/min value: 4
Value of x that maximizes function: 4
Domain: $(-\infty, \infty)$
Range: $(-\infty, 4]$
Increasing: $(-\infty, 4)$
Decreasing: $(4, \infty)$