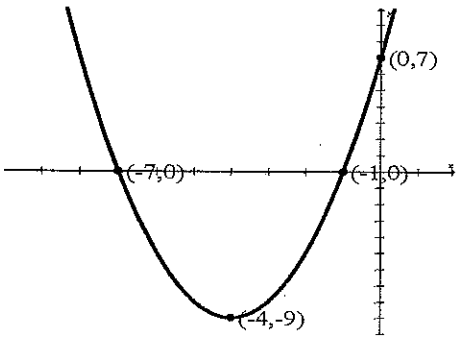
3.1 Graphing Quadratic Functions Notes

Quadratic Form $f(x)=ax^2+bx+c$

1. $f(x)=x^2+8x+7$



The quadratic term a = 1

The linear term b = 8

The constant c = 7

a. What is the name of the point where the *y*-value or the function changes direction?

vertex

b. Since the *a* term is (positive, negative), the graph opens (up, down), and the vertex is the (maximum, minimum) value of the function.

c. vertex (-4 , -9)

d. Sketch the Line of Symmetry.
Its equation is x = -4

$x=\frac{-b}{2a}$ $x=\frac{-8}{2(1)}$

e. *y*-intercept (0 , 7) $x=-4$

f. x-intercepts (-7, 0) and (-1, 0)

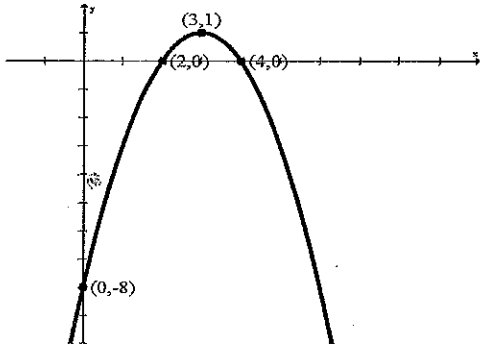
g. State the domain in inequality and interval notation:

$-\infty < x < \infty$; $(-\infty, \infty)$

h. State the range in inequality and interval notation:

$y \geq -4$; $[-4, \infty)$

2. $f(x)=-x^2+6x-8$



The quadratic term a = -1

The linear term b = 6

The constant c = -8

a. What is the name of the point where the *y*-value or the function changes direction?

vertex

b. Since the *a* term is (positive, negative), the graph opens (up, down), and the vertex is the (maximum, minimum) value of the function.

c. vertex (3 , 1)

d. Sketch the Line of Symmetry.
Its equation is x = 3

$x=\frac{-b}{2a}$ $x=\frac{-6}{2(-1)}=\frac{-6}{-2}$ $x=3$

e. *y*-intercept (0 , -8)

f. x-intercepts (2 , 0) and (4 , 0)

g. State the domain in inequality and interval notation:

$-\infty < x < \infty$; $(-\infty, \infty)$

h. State the range in inequality and interval notation:

$y \leq 1$; $(-\infty, 1]$

3. $f(x) = -x^2 - 8x - 12$

The quadratic term $a = -1$
The linear term $b = -8$
The constant $c = -12$

a. Since the *a* term is (positive, negative), the graph opens (up, down), and the vertex is the (maximum, minimum) value of the function.

b. axis of symmetry: $x = \frac{-b}{2a} = \frac{8}{2(-1)} = \frac{8}{-2}$

$x = -4$

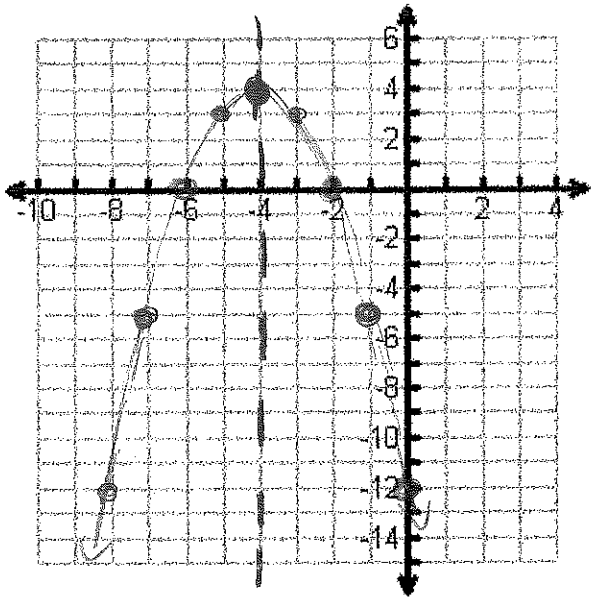
c. vertex $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$ → (-4, 4)

d. *y*-intercept $(0,c)$ (0, -12)

e. x-intercepts (-6, 0) & (-2, 0)

x	$-(x)^2 - 8(x) - 12$	f(x)	(x , f(x))
-7		-5	(-7, -5)
-6		0	(-6, 0)
-5		3	(-5, 3)
-4	$-(-4)^2 - 8(-4) - 12$	4	(-4, 4)
-3	$-(-3)^2 - 8(-3) - 12$	3	(-3, 3)
-2	$-(-2)^2 - 8(-2) - 12$	0	(-2, 0)
-1	$-(-1)^2 - 8(-1) - 12$	-5	(-1, -5)
0		-12	(0, -12)

vertex



f. State the domain

inequality notation: $-\infty < x < \infty$

interval notation: $(-\infty, \infty)$

g. State the range

inequality notation: $y \leq 4$

interval notation: $(-\infty, 4]$

4. A tour bus in Dallas serves 400 customers a day. The charge is $5 per person. The owner of the bus service estimates that the company would lose 10 passengers a day for each $0.50 fare increase.

X = # of fare increases Y = income

a. How much should the fare be in order to maximize the income for the company?

$Y = (400 - 10x)(5 + .50x)$ (People, Price)

$Y = 2000 + 200x - 50x - 5x^2$

$Y = -5x^2 + 150x + 2000$

Vertex

$x = \frac{-b}{2a} = \frac{-150}{2(-5)} = \frac{-150}{-10}$

$x = 15$ ← fare increase

$5 + .50(15)$

$5 + 7.5 = \$12.50$

b. What is the maximum income the company can expect to make?

$Y = -5(15)^2 + 150(15) + 2000$

$Y = -1125 + 750 + 2000 = 1625$

$1625