Math 1050 ~ College Algebra
6 Quadratic Functions

- Graph a quadratic function through transformations of $f(x) = x^2$.
- Change a quadratic function from general to standard form.
- Find the vertex and axis of symmetry of a quadratic function.
- Find the intercepts of a quadratic function.
- Graph a quadratic function using vertex, axis of symmetry and

Quadratic Functions

A polynomial function: $f(x) = a_n x^n + a_{n-1}x^{n-1} + a_{n-2}x^{n-2} + \cdots + a_l x + a_0$.

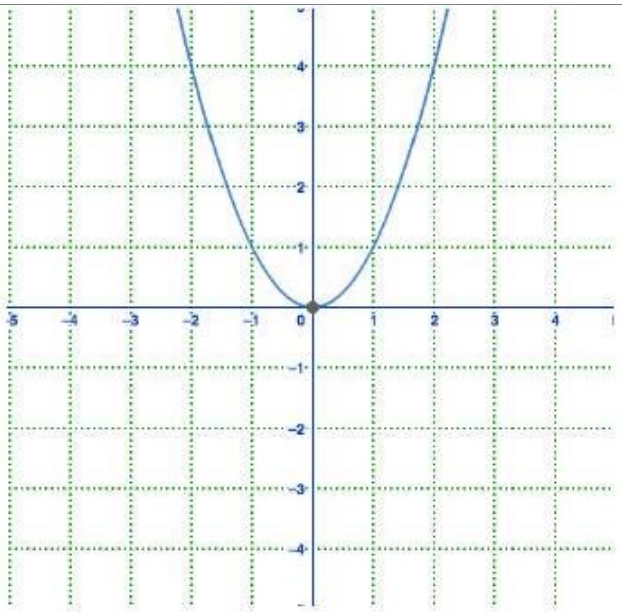
A quadratic function is a type of polynomial function where the degree $= 2$.
$f(x) = ax^2 + bx + c \qquad a, b, c \in \mathcal{R}, a \neq 0$

general form	standard form
$f(x) = ax^2 + bx + c$	$f(x) = a(x-h)^2 + k$

axis of symmetry

vertex

concavity



EX 1

Determine the vertex, axis of symmetry and concavity of each of these.

1a)

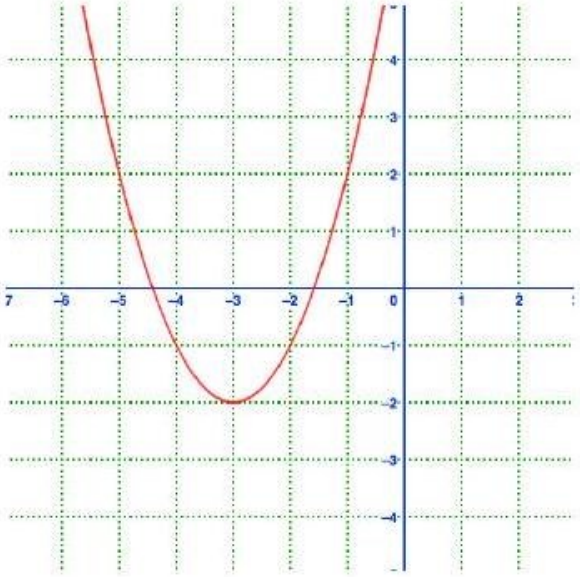
$f(x) = 3x^2 + 6x - 4$

1b)

$f(x) = -2(x + 3)^2 - 4$

EX 2

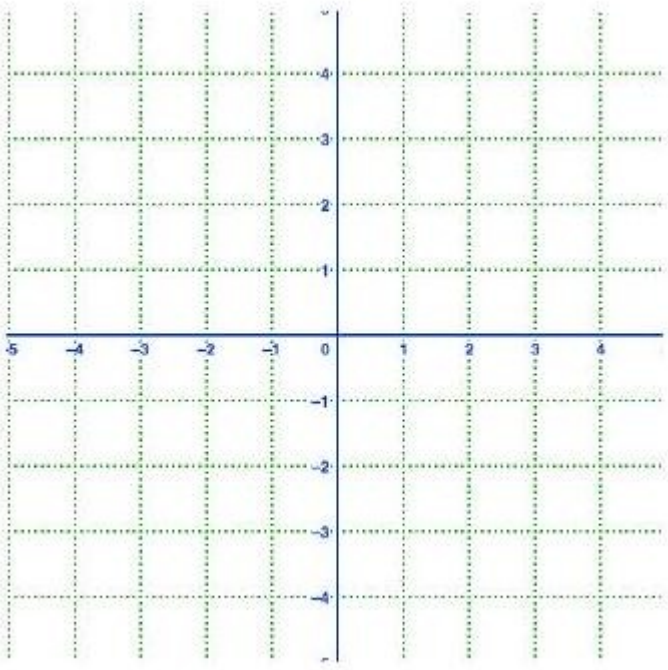
Write the equation of this quadratic function in standard form, then use algebra to write it in general form.



EX 3

Put this equation in standard form and sketch a graph of it.

$$y = -2x^2 + 4x + 2$$



Finding Roots of Quadratic Functions

To find the roots, solve for $f(x) = 0$.
If the expression on the left factors, set each factor equal to 0 and solve for x.
If you prefer not to factor, or it does not factor, you can always use the Quadratic Formula.

Quadratic Formula $ax^2 + bx + c = 0 \Rightarrow x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

EX 4

Determine the roots of each of these.

4a)

$f(x) = 3x^2 + 5x - 4$

4b)

$f(x) = 9x^2 - 6x + 1$

4c)

$f(x) = 4x^2 - 6x - 3$

In the quadratic formula, the expression inside the radical is called the discriminant. It determines whether there is one real root, two real roots or no real roots.

EX 5

Find the discriminant of the equations in example 4.

5a)

$f(x) = 3x^2 + 5x - 4$

5b)

$f(x) = 9x^2 - 6x + 1$

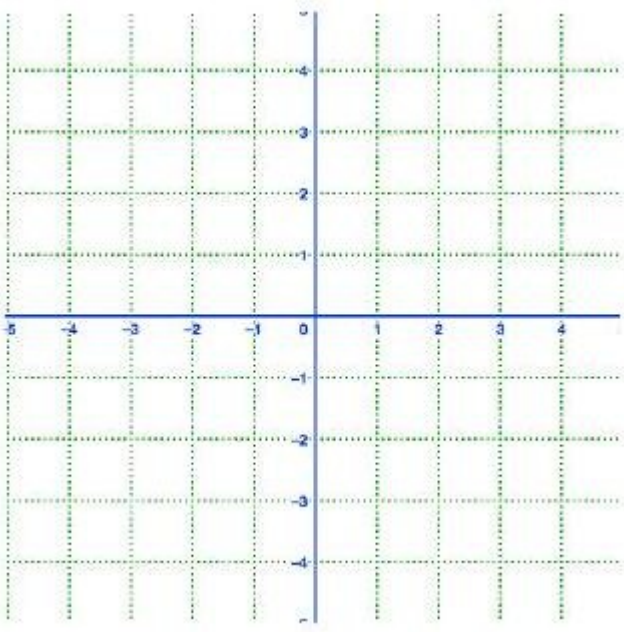
5c)

$f(x) = 4x^2 - 6x - 3$

EX 6

For this function, find the vertex, axis of symmetry, x and y-intercepts and sketch it.

$$f(x) = -\frac{1}{2}(x^2 - 10x + 21)$$



An Application Problem

EX 7

The height of an object shot straight up in the air from a height of 128 feet at an initial velocity of 32ft/sec is modeled by $h(t) = -16t^2 + 32t + 128$, where $t =$ time.

Determine the maximum height the object reaches and the time it will hit the ground.