Review of Quadratics

Forms →

standard form $y = ax^2 + bx + c$

$a > 0$ opens up
$a < 0$ open down

$0 < a < 1$ wider than $y = x^2$
$1 < a$ narrower than $y = x^2$

b affects the location of vertex
c is the y-intercept

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

a is the same as in standard form

vertex is ½ between the roots → r and s are the roots

$c = a \cdot r \cdot s$ (y-intercept)

vertex form - $y = a(x-h)^2 + k$

a is the same as in standard form

(h, k) is the vertex

Graphing

- By hand → standard form → use table of values

does it factor?

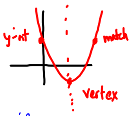
factors
$y = a(x-r)(x-s)$
- opens up/down
- roots (x-intercepts)
- y-intercept
- vertex (½ way between x-intercepts)

doesn't factor
use partial factoring (factor 1st two terms)
- two points at same level (same y-value)
- vertex (½ between two points)
- opens up/down.

- By hand → vertex form

$y = a(x-h)^2 + k$

- opens up/down
- (h, k) vertex
- y-intercept
- find matching point on other side side of axis of symmetry



- Use your calculator, find:
  - zeros (x-intercepts)
  - min + max (vertex)

Equation from Graph (or word problem)

- x-intercepts
- point

} factored form

- vertex
- point

} vertex form

Solving Quadratics (find x)

- Graphing (use calculator)
  - standard form (graph the function + find the zeros)
  - not in standard form (graph LS and RS + find the intersection pts) (y_1, y_2)
- Algebraically
  - factors (set each factor equal to zero)
  - doesn't factor ?? Quadratic Formula

Remember to give points (x, y) when you are asked for the vertex, intercept(s) or intersection point. An axis of symmetry is given as an equation like x = -4

A ***zero*** is for a function. It is the value of x when f(x) = 0.

if f(x) = x + 1, the zero is x = -1

and the x-intercept for the graph of the function is (-1, 0)

A ***root*** is for an equation when the function is set equal to zero. It is the value of x that satisfies the equation.

if x + 1 = 0, the root is x = -1

Solve means to find the value of x that makes the equation true

What if you need to find the x-intercepts for a function that is in vertex for?

ex. $f(x) = 2(x-1)^2 - 9$

$$0 = 2(x-1)^2 - 9$$

$$9 = 2(x-1)^2$$

$$\frac{9}{2} = (x-1)^2$$

$$x - 1 = \pm\sqrt{\frac{9}{2}}$$

$$x = 1 \pm \sqrt{\frac{9}{2}}$$

$$x = 1 + \sqrt{\frac{9}{2}}$$

$$x = 1 - \sqrt{\frac{9}{2}}$$

$$\sqrt{\frac{9}{2}} = \frac{3}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{3\sqrt{2}}{2}$$

$$1 \pm \frac{3\sqrt{2}}{2}$$

§7.7 Solving Quadratic Equations using the Quadratic Formula

The equation must be in standard form:

$$0 = ax^2 + bx + c$$

$\frac{3+1}{5}$

$\frac{3}{5} + \frac{1}{5}$

Quadratic Formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\frac{-b}{2a} \pm \frac{\sqrt{b^2 - 4ac}}{2a}$$

vertex

Example 2 (p 424)

Solve the followin equation (algebraically):

$$6x^2 - 3 = 7x$$

$$6x^2 - 7x - 3 = 0 \quad \text{(standard form)}$$

$a = 6$
$b = -7$
$c = -3$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{7 \pm \sqrt{(-7)^2 - 4(6)(-3)}}{2(6)}$$

$$x = \frac{7 \pm 11}{12}$$

$$x = \frac{7 + 11}{12} \quad \text{and} \quad x = \frac{7 - 11}{12}$$

$$x = \frac{18}{12} \qquad x = \frac{-4}{12}$$

$$x = \frac{3}{2} \qquad x = -\frac{1}{3}$$

→ factor using decomposition

$$(6x^2 - 9x) + (2x - 3) = 0$$

$$3x(2x - 3) + 1(2x - 3) = 0$$

$$(2x - 3)(3x + 1) = 0$$

$$2x - 3 = 0 \qquad 3x + 1 = 0$$

$$2x = 3 \qquad 3x = -1$$

$$x = \frac{3}{2} \qquad x = \frac{-1}{3}$$

vertex:

$$\frac{-b}{2a}$$

$$\frac{-(-7)}{2(6)} = \frac{7}{12}$$

Example 3 (p425)

Solve this quadratic equation (algebraically):

$$2x^2+8x-5=0$$

State your answer as an exact value.

$a=2$
$b=8$
$c=-5$

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$x=\frac{-8\pm\sqrt{8^2-4(2)(-5)}}{2(2)}$$

$$x=\frac{-8\pm\sqrt{104}}{4}$$ ← leave as a radical unless it is a perfect square.

$\sqrt{104}$
$\sqrt{4\cdot 26}$
$\sqrt{4}\cdot\sqrt{26}$
$2\sqrt{26}$

$$x=\frac{-8\pm 2\sqrt{26}}{4}$$

$$x=\frac{-\cancel{8}^{4}+\cancel{2}^{1}\sqrt{26}}{\cancel{4}_{2}} \quad \text{and} \quad x=\frac{-8-2\sqrt{26}}{4}$$

$$x=\frac{-4+\sqrt{26}}{2} \qquad x=\frac{-4-\sqrt{26}}{2}$$

Vertex: $x=\frac{-b}{2a}=\frac{-8}{2(2)}=\frac{-8}{4}=-2$

TO DO

① CYU (p427)
② p428 | 4-10, 13