Homework: pg. 177 # 1ad, 2bd, 4abc, 5b, 7, 8, 15, pg. 185 #1abde, 2ac, 8

Solving Quadratic Equations

There are multiple ways to solve a quadratic equation:

1. Factoring (Zero Principle)
2. Quadratic Formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
3. Graphing

Example 1

Solve each equation for x.

a) $x^2 + x - 12 = 0$

$(x+4)(x-3) = 0$

$x = -4$ or $x = 3$

b) $\overset{a}{x^2} + \overset{b}{2x} - \overset{c}{1.25} = 0$

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

$= \frac{-2 \pm \sqrt{(2)^2 - 4(1)(-1.25)}}{2(1)}$

$= \frac{-2 \pm \sqrt{4+5}}{2}$

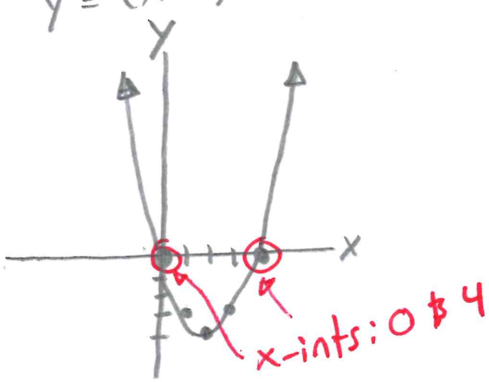
$= \frac{-2 \pm 3}{2}$

$= \frac{1}{2}$ or $-\frac{5}{2}$

c) $(x-2)^2 - 4 = 0$

Graph

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



Sol^{ns} $x = 0$ $ 4

d) $2x^2 = x + 3$

$2x^2 - x - 3 = 0$ $\left.\begin{matrix} P(-6) \\ S(-1) \end{matrix}\right\} 2, -3$

$2x^2 + 2x - 3x - 3 = 0$

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

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

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

$\left\{\begin{matrix} 2x - 3 = 0 \\ \frac{2x}{2} = \frac{3}{2} \\ x = \frac{3}{2} \end{matrix}\right.$

e) $x^2 - 2x + 3 = 0$

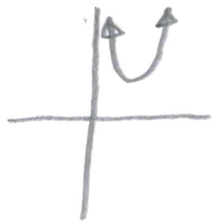
$x = \dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$

$= \dfrac{2 \pm \sqrt{(-2)^2-4(1)(3)}}{2(1)}$

$= \dfrac{2 \pm \sqrt{-8}}{2}$

negative

No Sol^n



f) $x^2 - 3x + 2.25 = 0$

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

$= \dfrac{3 \pm \sqrt{(-3)^2-4(1)(2.25)}}{2(1)}$

$= \dfrac{3 \pm \sqrt{0}}{2}$

$x = \dfrac{3}{2}$

Notice that a quadratic equation can have zero, one, or two real solutions. We can use the part of the quadratic formula under the square root (the discriminant) to determine how many roots each quadratic equation will yield.

discriminant → $b^2 - 4ac$

If $b^2 - 4ac > 0$ → two real roots

$b^2 - 4ac = 0$ → one real root

$b^2 - 4ac < 0$ → no real roots

Example 2

For each quadratic equation below, use the discriminant to determine how many real roots they will each possess.

a) $x^2 - 5x + 7 = 0$

b^2-4ac

$= (-5)^2-4(1)(7)$

$= 25 - 28$

$= -3$

∴ No real roots.

b) $2x^2 + 4x + 2 = 0$

b^2-4ac

$= (4)^2-4(2)(2)$

$= 16 - 16$

$= 0$

∴ One real root.

c) $3x^2 = 8 - x$

$3x^2+x-8=0$

b^2-4ac

$= (1)^2-4(3)(-8)$

$= 1+96$

$= 97$

∴ Two real roots.