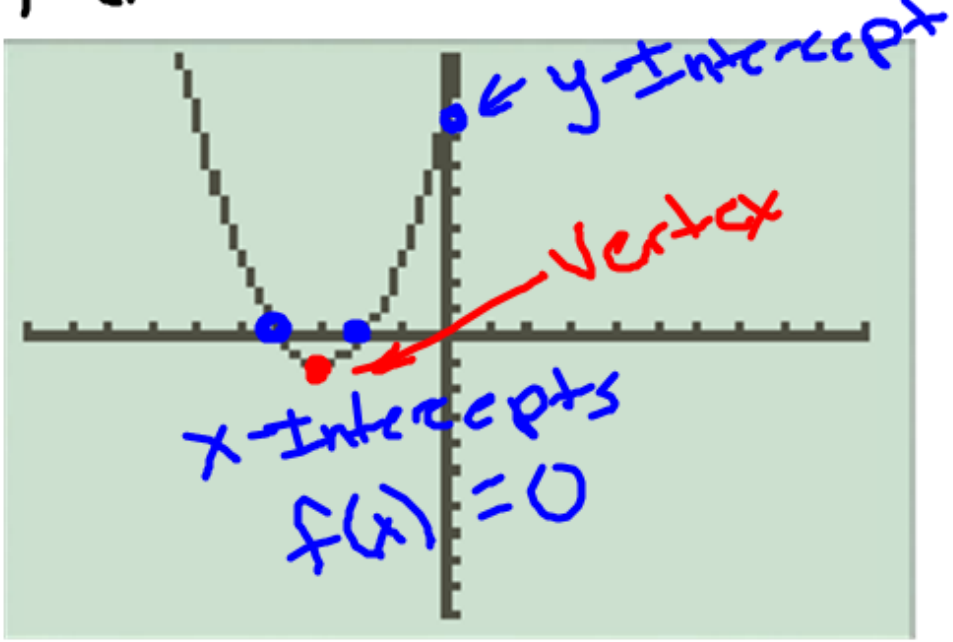
Quadratic Equations

$$f(x) = ax^2 + bx + c \qquad a \neq 0$$

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



x-Int = $-2, -4$

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

$8 = 4 \cdot 2$

$6 = 4 + 2$

$0 = x^2 + 6x + 8$

$0 = (x+4)(x+2)$

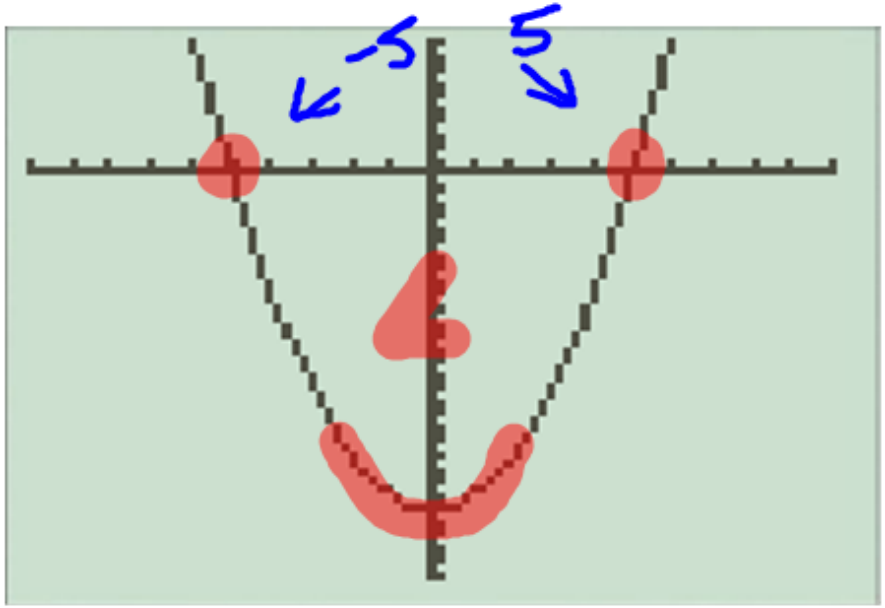
$x + 4 = 0$

$x = -4$

$x + 2 = 0$

$x = -2$

$f(x) = x^2 - 25$

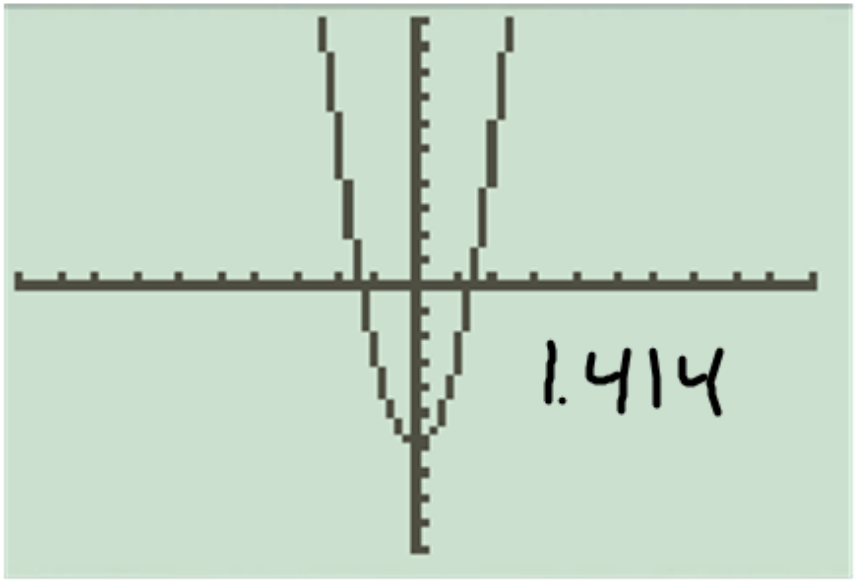


$0 = x^2 - 25$

$\sqrt{25} = \sqrt{x^2}$

$\pm 5 = x$

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



$0 = 3x^2 - 6$

$+6 \qquad +6$

$\frac{6}{3} = \frac{3x^2}{3}$

$\sqrt{2} = \sqrt{x^2}$

$\pm\sqrt{2} = x$

$$f(x) = 4x^2 + 9$$

$$4x^2 + 9 = 0$$

$$-9 \quad -9$$

$$\frac{4x^2}{4} = \frac{-9}{4}$$

$$\sqrt{x^2} = \sqrt{\frac{-9}{4}}$$

$$x = \pm \frac{3}{2} i$$

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

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

$$x = -3$$

$$(x+3)^2 = 0$$

$$x^2 + 6x + 9 = 2$$

$$\sqrt{(x+3)^2} = \sqrt{2}$$

$$x + 3 = \pm\sqrt{2}$$

$$x = -3 \pm \sqrt{2}$$

$-3+\sqrt{2}$

$-3-\sqrt{2}$

$$x^2+6x+4=0$$

$$x^2+6x+9=-4+9$$

$$\sqrt{(x+3)^2}=\sqrt{5}$$

$$x+3=\pm\sqrt{5}$$

$$x=-3\pm\sqrt{5}$$

$x^2 + 14x - 8 = 0$ $\quad \frac{14}{2} = 7^2 = 49$

$x^2 + 14x \underline{+49} = 8 + 49$

$\sqrt{(x+7)^2} = \sqrt{57}$

$x + 7 = \pm\sqrt{57}$

$x = -7 \pm \sqrt{57}$

$x^2 - 5x + 6 = 0$ $\left(\frac{-5}{2}\right)^2 = \frac{25}{4}$

$x^2 - 5x + \frac{25}{4} = -6 + \frac{25}{4}$

$\sqrt{(x - 5/2)^2} = \sqrt{\frac{1}{4}}$

$x - 5/2 = \pm\frac{1}{2}$

$x = \frac{5}{2} \pm \frac{1}{2}$ $\nearrow \frac{5}{2} + \frac{1}{2} = \frac{6}{2} = 3$

$\searrow \frac{5}{2} - \frac{1}{2} = \frac{4}{2} = 2$

$$x^2 - 8x - 7 = 0 \qquad \frac{-8}{2} = (-4)^2 = 16$$

$$+7 \quad +7$$

$$x^2 - 8x + 16 = 7 + 16$$

$$\sqrt{(x-4)^2} = \sqrt{23}$$

$$x - 4 = \pm\sqrt{23}$$

$$x = 4 \pm \sqrt{23}$$

Quadratic Formula

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

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

Discriminant

$b^2 - 4ac > 0$ two solutions

$b^2 - 4ac = 0$ one solution

$b^2 - 4ac < 0$ two imaginary solutions

$$3x^2 + 7x - 2 = 0$$

a b c

$b^2 - 4ac$

$(7)^2 - 4(3)(-2)$

$49 + 24$

$\sqrt{73}$

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

$$x = \frac{-(7) \pm \sqrt{73}}{2(3)}$$

$$x = \frac{-7 \pm \sqrt{73}}{6}$$

$-8 = 8 \quad -1$

$7 = 8 + -1$

$$2x^2 + 7x - 4 = 0$$

$$2x^2 + 8x - 1x - 4 = 0$$

$$2x(x+4) - 1(x+4) = 0$$

$$(2x-1)(x+4) = 0$$

$2x - 1 = 0$

$2x = 1$

$x = 1/2$

$x + 4 = 0$

$x = -4$

$$2x^2 + 7x - 4 = 0$$

a b c

$b^2 - 4ac$

$(7)^2 - 4(2)(-4)$

$49 + 32$

$\sqrt{81}$

9

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

$$x = \frac{-(7) \pm 9}{2(2)}$$

$$x = \frac{-7+9}{4} = \frac{2}{4} = \frac{1}{2}$$

$$x = \frac{-7-9}{4} = \frac{-16}{4} = -4$$

Four Methods

Factoring

Square Root

Completing the square

Quadratic Formula

$$14(x-4) - (x+2) = (x+2)(x-4)$$

$$14x - 56 - x - 2 = x^2 - 4x + 2x - 8$$

$$-14x + 56 + x + 2$$

$$0 = x^2 - 15x + 50 \qquad 50 = 10 \cdot 5$$

$$(x-10)(x-5)$$

$$x = 10 \qquad x = 5$$

$$x - 10 = 0$$

$$+10 \quad +10$$

$$x = 10$$

$$0 = \underset{a}{x^2} - \underset{b}{15x} + \underset{c}{50}$$

$b^2 - 4ac$

$(-15)^2 - 4(1)(50)$

$225 - 200$

$\sqrt{25}$

5

$$x = \frac{-(-15) \pm 5}{2(1)}$$

$$x = \frac{15 + 5}{2} = \frac{20}{2} = 10$$

$$x = \frac{15 - 5}{2} = \frac{10}{2} = 5$$

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

$$3x^2 + 6x - 1 = 0$$

$a \quad b \quad c$

$$\frac{2(-3 \pm 2\sqrt{3})}{2(3)}$$

$b^2 - 4ac$

$(6)^2 - 4(3)(-1)$

$36 + 12$

$\sqrt{48} = 4\sqrt{3}$

$$X = -\frac{(6) \pm 4\sqrt{3}}{2(3)}$$

$$X = -\frac{6 \pm 4\sqrt{3}}{6}$$

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

$$x^2 - 6x + 10 = 0$$

$$\frac{-6}{2} = (-3)^2 = 9$$

$$x^2 - 6x + 9 = -10 + 9$$

$$\sqrt{(x-3)^2} = \sqrt{-1}$$

$$x - 3 = \pm i$$

$$x = 3 \pm i$$

$$x^2 - 6x + 10 = 0$$

$a \quad b \quad c$

$b^2 - 4ac$

$(-6)^2 - 4(1)(10)$

$36 - 40$

$\sqrt{-4}$

$2i$

$$x = \frac{-(-6) \pm 2i}{2(1)}$$

$$x = \frac{6 \pm 2i}{2}$$

$$x = 3 \pm i$$