5.4 Solving from Vertex Form

Recall: Vertex Form

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

- vertex is (h, k)
- if a>0, opens UP
- if a<0, opens DOWN

1. Determine the number of x-intercepts, then determine their value.

a) $y = (x+2)^2 - 9$

Vertex? Opens up or down?

V (-2, -9) UP!

∴ 2 zeroes!

y=0 at x-axis

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

$9 = (x+2)^2$

$\pm\sqrt{9} = \sqrt{(x+2)^2}$

$\pm 3 = x+2$

$\pm 3 - 2 = x$

$x = +3 - 2 = 1$

$x = -3 - 2 = -5$

b) $y = -7(x-5)^2$

V(5,0) DOWN!

∴ One zero

y=0

$0 = -7(x-5)^2$

$0 = (x-5)^2$

$\pm\sqrt{0} = x-5$

$0 = x-5$

$5 = x$

c) $y = -2(x+7)^2 - 8$

V(-7,-8) DOWN!

∴ NO zeroes!

(Just to show you....)

$0 = -2(x+7)^2 - 8$

$8 = -2(x+7)^2$

$-4 = (x+7)^2$

$\pm\sqrt{-4} = x+7$

Can't proceed

d) $y = -3(x-1)^2 + 2$

V(1, 2) DOWN

∴ 2 zeroes

y=0

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

$-2 = -3(x-1)^2$

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

$\pm\sqrt{\frac{2}{3}} = x-1$

$\pm\sqrt{\frac{2}{3}} + 1 = x$

$x = \sqrt{\frac{2}{3}} + 1$ EXACT $x = -\sqrt{\frac{2}{3}} + 1$

$= 1.8$ $= 0.2$

APPROX.

2. Solve.

a) $0 = 3(x-5)^2 - 12$

V(5, -12) UP

∴ 2 zeros

$0 = 3(x-5)^2 - 12$

$12 = 3(x-5)^2$

$4 = (x-5)^2$

$\pm\sqrt{4} = x-5$

$\pm 2 + 5 = x$

$2+5 = x$ $\quad$ $-2+5 = x$

$7 = x$ $\quad$ $3 = x$

b) $-2(x+7)^2 = -5$

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

V(-7, 5) Down

$-2(x+7)^2 = -5$

$(x+7)^2 = \frac{5}{2}$

$x+7 = \pm\sqrt{\frac{5}{2}}$

$x = \pm\sqrt{\frac{5}{2}} - 7$

$x = \sqrt{\frac{5}{2}} - 7$ $\quad$ $x = -\sqrt{\frac{5}{2}} - 7$

$\doteq -5.4$ $\quad$ $\doteq -8.6$

c) $4(x-1)^2 + 6 = 0$

V(1, 6) UP!

∴ NO zeros

d) $4(x-3)^2 = 25$

V(3, -25) UP

∴ 2 zeros

$4(x-3)^2 = 25$

$(x-3)^2 = \frac{25}{4}$

$x-3 = \pm\sqrt{\frac{25}{4}}$

$x-3 = \pm\frac{\sqrt{25}}{\sqrt{4}}$

$x-3 = \pm\frac{5}{2}$

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

$x = \frac{5}{2} + 3$ $\quad$ $x = -\frac{5}{2} + 3$

$= \frac{5}{2} + \frac{6}{2}$ $\quad$ $= -\frac{5}{2} + \frac{6}{2}$

$= \frac{11}{2}$ $\quad$ $= \frac{1}{2}$

$= 5.5$ $\quad$ $= 0.5$

Practice!

Set 1: Handout 5.4 #1, 3, 5, 6, 8, 10

Set 2: Handout 5.4 #7, 8, 9, 10, 11, 12