

Mathematics 10D

Q.06 – Solving From Vertex Form

Mr. D. Hagen

First of all, and most importantly, what is solving?

Solving is to find the value or values of a variable that make the equation true.

Ex1: $3x - 8 = 13$

$$\begin{array}{r} 3x = 21 \\ \hline 3 \quad 3 \end{array}$$

$$x = 7$$

Ex2: $2x^2 + 3 = 21$

$$\begin{array}{r} 2x^2 = 18 \\ \hline 2 \quad 3 \\ \hline x^2 = 9 \end{array}$$

$$x = 3 \text{ and } -3 \quad (x = \pm 3)$$

However, how would you solve: $3x^2 - 8x + 4 = 2x + 3$

we can't yet.

In the world of quadratics, solving means to find the x-intercepts or the zeros, hence we need to substitute 0 into y, or rewrite the equation so that it equals 0 (which is why I say Y to solve for the zeros, meaning find the value(s) of x so that $y=0$)

Solve!

$$y = 2(x-3)^2 - 18$$

Annotations:
 - y : shirt
 - x : pants
 - -18 : socks
 - $(x-3)^2$: Under-You

$$\begin{aligned} 18 &= 2(x-3)^2 \\ \frac{18}{2} &= \frac{2(x-3)^2}{2} \\ \sqrt{9} &= (x-3)^2 \\ \pm 3 &= x-3 \\ \pm 3 + 3 &= x \end{aligned}$$

	-3	+3	④
	() ²	±√	③ undo.
	× 2	÷ 2	②
	-18	+18	①

Arrows: A red arrow points down from the first row to the last row. A red arrow points up from the last row to the first row.

$$\begin{aligned} \oplus \quad 3 + 3 &= x \\ 6 &= x \end{aligned}$$

$$\begin{aligned} \ominus \quad -3 + 3 &= x \\ 0 &= x \end{aligned}$$

∴ the zeros are 6 and 0

$$y = 2(x-6)(x-0)$$

Solve another!

$$\textcircled{y} = -5(x+6)^2 + \textcircled{8}70$$

$$\frac{-80}{-5} = \frac{-5(x+6)^2}{-5}$$

$$\sqrt{16 = (x+6)^2}$$

$$\pm 4 = x+6$$

$$\pm 4 - 6 = x$$

$$\textcircled{+} x = 4 - 6$$

$$x = -2$$

$$\textcircled{-} x = -4 - 6$$

$$x = -10$$

$$\therefore y = 2(x+2)(x+10)$$

The first two were neat and tidy, how about one that isn't!

$$(y) = -7(x-12)^2 + 19$$

$$\begin{array}{r} -19 = -7(x-12)^2 \\ \hline -7 \end{array}$$

$$\sqrt{2.7143} = (x-12)^2$$

$$\pm 1.6475 = x-12$$

$$\pm 1.6475 + 12 = x$$

$$\textcircled{+} x = 1.6475 + 12$$

$$x = 13.6475 \approx 13.65$$

$$\textcircled{-} x = -1.6475 + 12$$

$$x = 10.3525 \approx 10.35$$

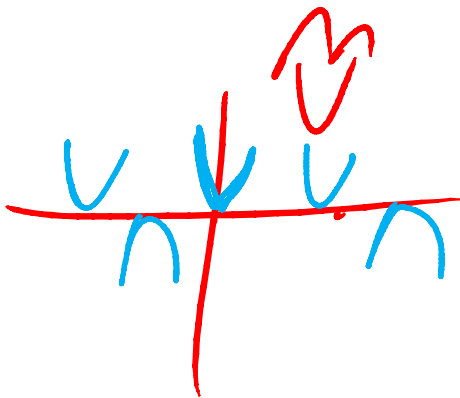
Are there always 2 answers?

$$y = 4(x+8)^2 + 6$$

$$\begin{aligned} -6 &= 4(x+8)^2 \\ -1.5 &= (x+8)^2 \end{aligned}$$

Error

No solutions



$$y = -3(x+4)^2 + 0$$

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

$$0 = x+4$$

$$-4 = x$$

\therefore The only solution is $x = -4$