I will be able to use the quadratic formula to find roots.

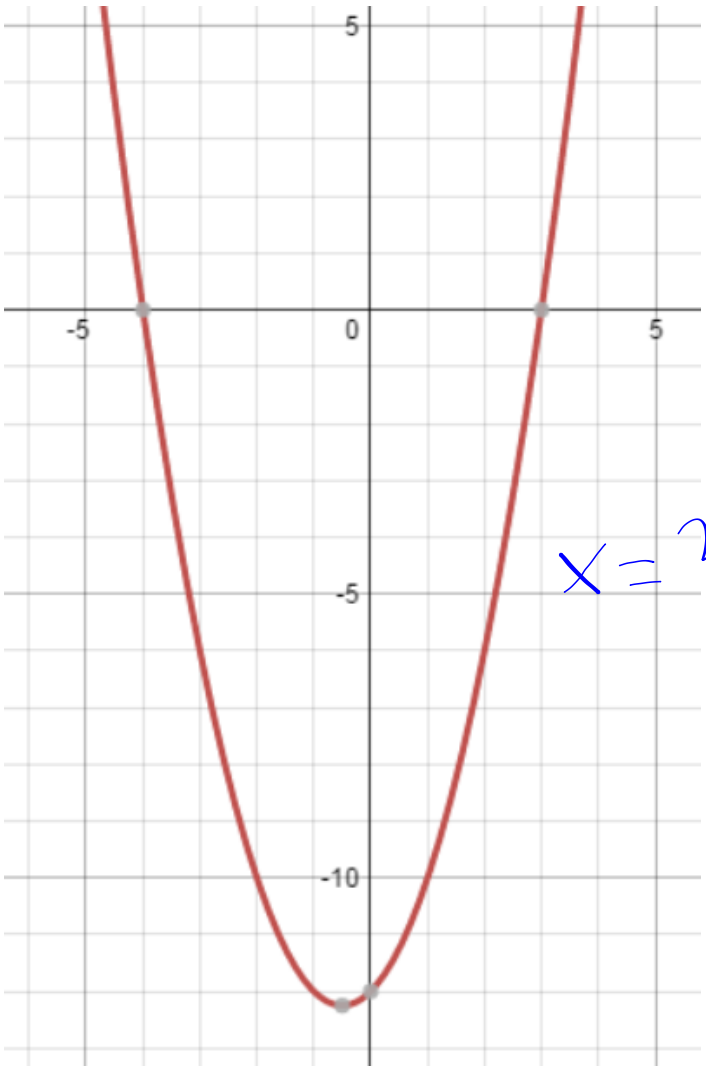
Minds on Why do we need the QF?

The best of QF and pitfalls!

Action! Introducing the QF

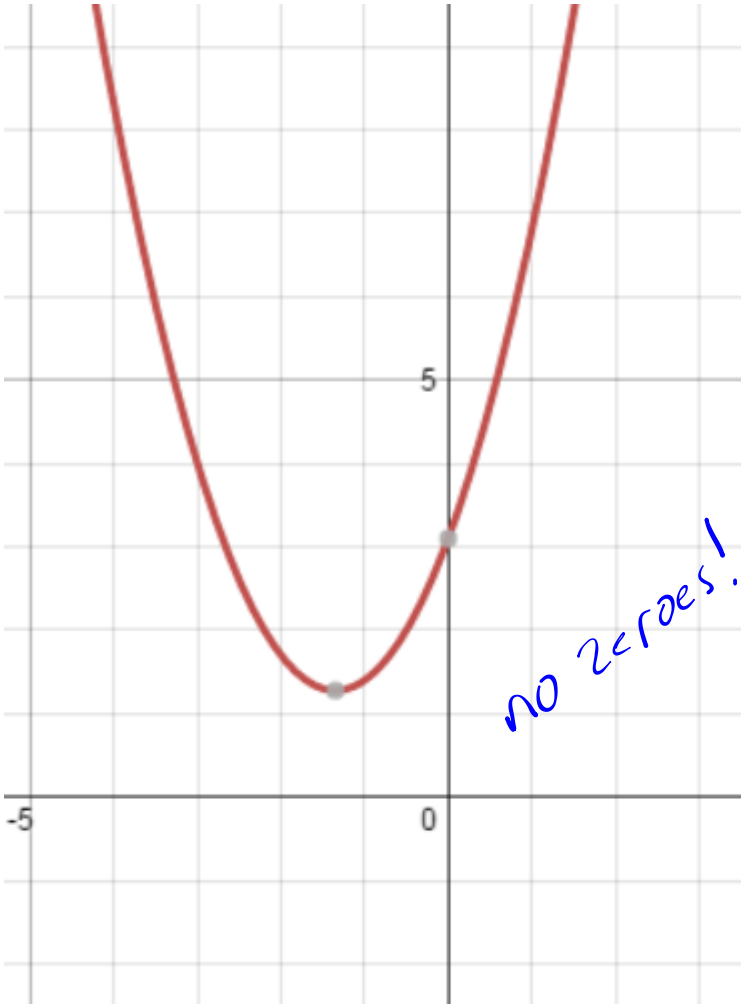
Consolidation Practice Problems

Minds on

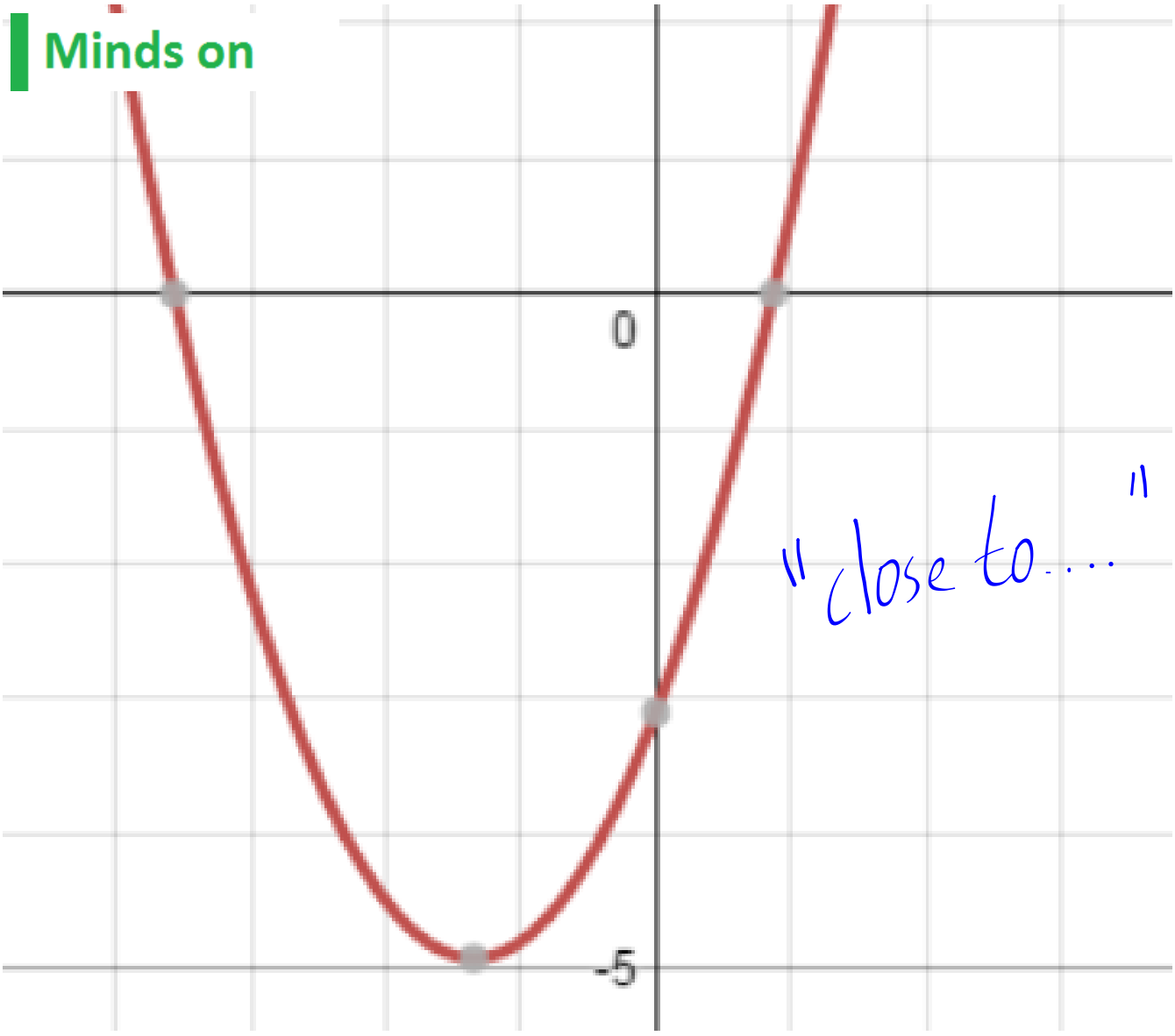


$x = 3, -4$

Minds on



Minds on



The quadratic formula is awesome because...

1. If a quadratic has zeros and can't be easily factored, it lets you find them. Even if they are hideous decimals.

2. There's a song. A really catchy song. It helps you remember it.

Students sometimes screw up the quadratic formula because....

1. They don't memorize the formula (they forget the song!)

2. They don't have their own calculator and the button order is different depending on which one you use.

3. They don't practice punching in calculator buttons because they think it seems so easy. And then they don't actually know how to do the calculator part.

Lesson 6.4 - The Quadratic Formula

Earlier we looked at the equation $y = x^2 + 4x - 1$ and used Completing the Square to write it in Vertex Form. But what if we actually needed the zeroes? How are we to solve these types of questions that can't be factored the way we're used to factoring? We can solve these questions using the *Quadratic Formula*!!!!

Given any quadratic equation in the form $ax^2 + bx + c = 0$, the roots/zeros/solutions are:

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

Solve: $2x^2 + 5x - 3 = 0$ $a = 2$ $b = 5$ $c = -3$

$a \times c = -6$

Using Factoring: ($b = 5$)	Using the Formula:
$2x^2 + 6x - 1x - 3 = 0$ $2x(x+3) - 1(x+3) = 0$ $(x+3)(2x-1) = 0$ $x = -3$ $x = \frac{1}{2}$	$x = \frac{-5 \pm \sqrt{(5)^2 - 4(2)(-3)}}{2(2)}$ $x = \frac{-5 \pm \sqrt{25+24}}{4}$ $x = \frac{-5 \pm \sqrt{49}}{4}$ $x = \frac{-5+7}{4}$ and $x = \frac{-5-7}{4}$ $x = 0.5$ $x = -3$

Example 1: Use the formula to solve the following quadratic equations:

a) $2x^2 + 4x - 10 = 0$

$a \quad b \quad c$

$$x = \frac{-4 \pm \sqrt{(4)^2 - 4(2)(-10)}}{2(2)}$$

$$x = \frac{-4 \pm \sqrt{16 + 80}}{4}$$

$$x = \frac{-4 \pm \sqrt{96}}{4}$$

$$x = \frac{-4 + \sqrt{96}}{4} \text{ and } x = \frac{-4 - \sqrt{96}}{4}$$

$$x = 1.45 \qquad x = -3.45$$

b) $5x^2 - 4x - 3 = 0$

$a \quad b \quad c$

$$x = \frac{4 \pm \sqrt{(-4)^2 - 4(5)(-3)}}{2(5)}$$

$$x = \frac{4 \pm \sqrt{16 + 60}}{10}$$

$$x = \frac{4 \pm \sqrt{76}}{10}$$

$$x = \frac{4 + \sqrt{76}}{10} \text{ and } x = \frac{4 - \sqrt{76}}{10}$$

$$x = 1.27 \qquad x = -0.47$$

c) $2x^2 - 10 = 8$

$-8 \quad -8$

$2x^2 - 18 = 0$

$a = 2$
$b = 0$
$c = -18$

$$x = \frac{0 \pm \sqrt{0^2 - 4(2)(-18)}}{2(2)}$$

$$x = \frac{0 \pm \sqrt{144}}{4}$$

$x = \frac{0 + \sqrt{144}}{4}$ and $x = \frac{0 - \sqrt{144}}{4}$

$x = 3$ $\quad x = -3$

d) $3x(5x - 4) + 2x = x^2 - 4(x - 3)$

$15x^2 - 12x + 2x = x^2 - 4x + 12$

$-x^2 \quad +4x \quad -12 \quad -x^2 \quad +4x \quad -12$

$14x^2 - 6x - 12 = 0$

$a = 14$
$b = -6$
$c = -12$

$$x = \frac{6 \pm \sqrt{(-6)^2 - 4(14)(-12)}}{2(14)}$$

$$x = \frac{6 \pm \sqrt{36 + 672}}{28}$$

$$x = \frac{6 \pm \sqrt{708}}{28}$$

$x = \frac{6 + \sqrt{708}}{28}$ and $x = \frac{6 - \sqrt{708}}{28}$

$x = 1.16$ $\quad x = -0.74$

Perimeter

Example 2: A rectangular field is going to be completely enclosed by 100 m of fencing. Create a quadratic relation that shows how the area of the field will depend on its width. Then determine the dimensions of the field that will result in an area of 575 m^2.

$P = l + l + w + w$

$P = 2l + 2w$

$100 = 2l + 2w$

$50 = l + w$

$-w \quad -w$

$l = 50 - w$

sub $l = 50 - w$ into Area equation

$A = l \times w$

$A = (50 - w)(w)$

$A = w(50 - w)$

$A = 50w - w^2$

$575 = 50w - w^2$

$-575 \quad -575$

$0 = 50w - w^2 - 575$

$-w^2 + 50w - 575 = 0$

$a = -1$

$b = 50$

$c = -575$

$$w = \frac{-50 \pm \sqrt{(50)^2 - 4(-1)(-575)}}{2(-1)}$$

$$w = \frac{-50 \pm \sqrt{2500 - 2300}}{-2}$$

$$w = \frac{-50 + \sqrt{200}}{-2} \quad \text{or} \quad w = \frac{-50 - \sqrt{200}}{-2}$$

$w = 17.9$

$l = 50 - 17.9$

$= 32.1$

$w = 32.1$

$l = 50 - 32.1$

$l = 17.9$

$\therefore$ the field is 17.9 m $\times$ 32.1 m

Practice: Page 342 # 2, 8-10(you choose one part), 12, 13, 14