

1.3/1.4 Solving Quadratic Equations by Factoring Square Root Review

Recall that Quadratic Equations Come in 3 Forms...

- Standard Form: $ax^2 + bx + c = 0$
- Vertex Form: $a(x-h)^2 + k = 0$
- Intercept Form: $a(x-p)(x-q) = 0$

4 Methods of Solving Quadratic Equations (Algebraically)

1. Factoring
2. Quadratic formula
3. Completing the square
4. square root

Solving By Factoring

$$5 \cdot 0 = 0$$
$$5 \cdot 0 \neq 7$$

*Use solving by factoring when given a factorable standard form equation.

ex: Solve. (Find the roots of the equation.)

*Use the
Zero product
property*

a) $x^2 - x - 30 = 0$

$$(x - 6)(x + 5) = 0$$

$$x = 6, -5$$

$$b) -2x^2 + 34x = 0$$

$$-2x(x-17) = 0$$

$$x = 0, 17$$

$$c) x^2 = 64$$

$$x^2 - 64 = 0$$

$$(x+8)(x-8) = 0$$

$$x = -8, 8$$

$$d) 4x^2 + 4x + 1 = 0$$

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

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

← multiplicity of 2
mult. of 2

$$e) 4x^2 - 17x - 15 = 0$$

$$(4x+3)(x-5) = 0$$

$$4x+3=0$$

$$x = -\frac{3}{4} \quad x = 5$$

$$f) 7x^2 - 42 = -35x$$

$$7x^2 + 35x - 42 = 0$$

$$7(x^2 + 5x - 6) = 0$$

$$7(x+6)(x-1) = 0$$

$x = 1, -6$

$$g) x(x-4) = 4$$

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

Cannot be factored
(No solution)

Real Zeros

ex: Find the real zeros of the function.

Find the
x-intercepts.
(set $f(x) = 0$)

a) $f(x) = 14x^2 - 21x$

$$0 = 14x^2 - 21x$$

$$0 = 7x(2x - 3)$$

$$x = 0, \frac{3}{2}$$

b) $y = 16x^2 - 2x - 5$

$$0 = 16x^2 - 2x - 5$$

$$0 = (8x - 5)(2x + 1)$$

$$x = \frac{5}{8}, -\frac{1}{2}$$

$$\begin{array}{l} (4x - 5)(4x + 1) \quad \begin{array}{l} 4x \\ -20x \end{array} \\ \hline (4x + 5)(4x - 1) \quad \begin{array}{l} -4x \\ 20x \end{array} \end{array}$$

ex: Write a quadratic function in standard form with integral coefficients given the zeros.

a) $(9,0)$ & $(-3,0)$ $f(x) = (x-9)(x+3)$
 $f(x) = x^2 - 6x - 27$

b) $x=0.5$ multiplicity of 2
 $x = \frac{1}{2}$ $(2x-1)^2 = f(x)$
 $4x^2 - 4x + 1 = f(x)$

Perfect Squares

$1^2 = \underline{1}$

$7^2 = \underline{49}$

$2^2 = \underline{4}$

$8^2 = \underline{64}$

$3^2 = \underline{9}$

$9^2 = \underline{81}$

$4^2 = \underline{16}$

$10^2 = \underline{100}$

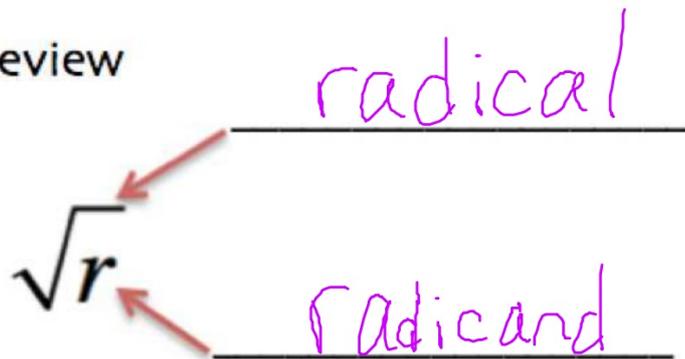
$5^2 = \underline{25}$

$11^2 = \underline{121}$

$6^2 = \underline{36}$

$12^2 = \underline{144}$

Square Root Review



Square Root Properties

• Multiplication: $\sqrt{ab} = \underline{\sqrt{a} \cdot \sqrt{b}}$

• Division: $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

$\sqrt{9+25} \neq 3+5$
 $\sqrt{34} \neq 8$

*There are NO sum ($\sqrt{a+b}$) or difference ($\sqrt{a-b}$) properties!!!

Simplifying Radicals

$$\sqrt{r}$$

*A radical is fully simplified when...

- the radicand has NO perfect square factors other than 1
- there is NO radical in the denominator
- the radicand does NOT involve decimals
- the radicand is positive

ex: Simplify.

a) $\sqrt{12}$

$$\frac{\sqrt{4} \cdot \sqrt{3}}{2\sqrt{3}}$$

b) $\sqrt{27}$

$$\frac{\sqrt{9} \cdot \sqrt{3}}{3\sqrt{3}}$$

$$c) \sqrt{500}$$

$$\sqrt{100} \cdot \sqrt{5}$$

$$10\sqrt{5}$$

$$d) \sqrt{98}$$

$$\sqrt{49} \cdot \sqrt{2}$$

$$7\sqrt{2}$$

$$e) \sqrt{72}$$

$$\sqrt{36} \cdot \sqrt{2}$$

$$6\sqrt{2}$$

$$\sqrt{9} \cdot \sqrt{8}$$

$$3\sqrt{8}$$

$$3\sqrt{4} \cdot \sqrt{2}$$

$$3 \cdot 2\sqrt{2}$$

$$6\sqrt{2}$$

$$f) \sqrt{\frac{9}{64}} = \frac{\sqrt{9}}{\sqrt{64}} = \frac{3}{8}$$

$$\frac{\overset{5}{\cancel{10}}\sqrt{2}}{\cancel{6}3}$$

$$g) \sqrt{\frac{25}{2}} = \frac{\sqrt{25}}{\sqrt{2}} = \frac{5}{\sqrt{2}} \left(\frac{\sqrt{2}}{\sqrt{2}} \right) = \frac{5\sqrt{2}}{2}$$

$$h) \sqrt{\frac{13}{2}} = \frac{\sqrt{13}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{26}}{2}$$

$(2+\sqrt{3})$ $(2-\sqrt{3})$
are conjugates

$$\frac{5}{2+8} \neq \frac{5}{2} + \frac{5}{8}$$

$$\frac{2+8}{5} = \frac{2}{5} + \frac{8}{5}$$

$$i) \frac{4}{(2-\sqrt{3})} \frac{(2+\sqrt{3})}{(2+\sqrt{3})}$$

$$= \frac{4(2+\sqrt{3})}{4 + \cancel{2\sqrt{3}} - \cancel{2\sqrt{3}} - \sqrt{9}} = \frac{4(2+\sqrt{3})}{4-3} = 4(2+\sqrt{3})$$

or
 $8+4\sqrt{3}$

$$j) \frac{2}{1+\sqrt{5}} \frac{(1-\sqrt{5})}{(1-\sqrt{5})}$$

$$\frac{2(1-\sqrt{5})}{1-\sqrt{25}} = \frac{2(1-\sqrt{5})}{-4} \quad \frac{1-\sqrt{5}}{-2} = \frac{-(1-\sqrt{5})}{2}$$

$$k) \frac{\sqrt{2}}{\sqrt{3}-\sqrt{8}} \frac{(\sqrt{3}+\sqrt{8})}{(\sqrt{3}+\sqrt{8})} = \frac{\sqrt{6}+4}{\sqrt{9}-\sqrt{64}} = \frac{\sqrt{6}+4}{3-8}$$

$$\frac{-(\sqrt{6}+4)}{5}$$

or

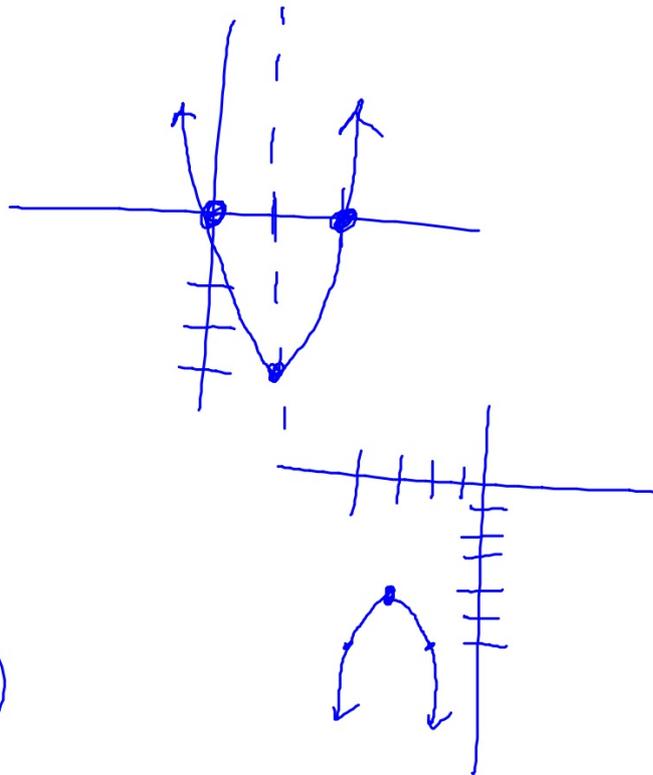
$$\frac{\sqrt{6}+4}{-5}$$

Review

ex: Sketch.

a) $y = 3x^2 - 6x$

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



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

$$(-3, -4)$$