

Lesson 28- Objective: SWBAT rationalize the denominator.

Kickoff

- Write the polynomial equation in standard form given the roots of: $\{-1, 0, 4\}$
- Write the polynomial equation in factored form given the roots of: $\{-3, 2 \pm \sqrt{6}\}$

1. $(x+1)(x-4)(x)$
 $x(x^2-3x-4)$
 $f(x) = x^2-3x-4x$

$(x+3)$
 $(x-2) = \frac{+6}{-6}$
 $x^2-x+4 = \frac{-6}{6}$
 $x^2-4x+4 = \frac{-6}{-6}$

$f(x) = (x+3)(x^2-4x-2)$

$x = -3$ $x = 2 \pm \sqrt{6}$
 $\frac{+3-3}{x+3=0}$ $\frac{2-2}{x-2 = (\pm\sqrt{6})^2}$
 $x^2-4x+4 = \frac{-6}{-6}$

$f(x) = (x+3)(x^2-4x-2)$

Try This: Perform the indicated operation.

a) $(x+5)(x-5)$
 $x^2 - 5x + 5x - 25$
 $x^2 - 25$

b) $(3+\sqrt{2})(3-\sqrt{2})$
 $9 - 3\sqrt{2} + 3\sqrt{2} - 2$
 $9 - 2$
 7

Conjugates - the same expression w/ opposite signs

Determine what number to multiply each expression by to get a rational number.

a) $\sqrt{2} \cdot \sqrt{2}$
 2

b) $\sqrt{7} \cdot \sqrt{7}$
 7

c) $3\sqrt{8} \cdot \sqrt{8}$
 $3 \cdot 8$
 24

Rationalize the Denominator that are Monomials:

- Identify the $\sqrt{\quad}$ in the denominator
- Multiply the numerator + denominator by the
- Simplify $\sqrt{\quad}$'s
- Reduce (if possible)

Examples:

1) $\frac{\sqrt{2}}{\sqrt{8}} \cdot \frac{\sqrt{8}}{\sqrt{8}} = \frac{4}{8} = \frac{1}{2}$

2) $\frac{\sqrt{10}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{\sqrt{50}}{5}$
 $\frac{5\sqrt{2}}{5} = \sqrt{2}$

3) $\frac{9}{4\sqrt{20}} \cdot \frac{\sqrt{20}}{\sqrt{20}}$
 $\frac{9\sqrt{20}}{4 \cdot 20} = \frac{9\sqrt{20}}{80}$
 $\frac{9 \cdot 2\sqrt{5}}{80} = \frac{18\sqrt{5}}{80} = \frac{9\sqrt{5}}{40}$

4) $\frac{5-\sqrt{6}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$
 $\frac{5\sqrt{2} - \sqrt{12}}{2}$
 $\frac{5\sqrt{2} - 2\sqrt{3}}{2}$
 $\frac{5\sqrt{2} - 2\sqrt{3}}{2}$
 $\frac{5\sqrt{2} - \sqrt{3}}{2}$

Rationalize the Denominator that are Binomials:

- Multiply the numerator and denominator by the conjugate
- Simplify $\sqrt{\quad}$'s
- Reduce

Examples:

1) $\frac{2}{4+\sqrt{3}} \cdot \frac{4-\sqrt{3}}{4-\sqrt{3}}$
 $\frac{2(4-\sqrt{3})}{16-3}$
 $\frac{2-2\sqrt{3}}{-2} = \frac{2}{-2} + \frac{2\sqrt{3}}{2} = -1 + \sqrt{3}$

2) $\frac{\sqrt{2}}{2-\sqrt{6}} \cdot \frac{2+\sqrt{6}}{2+\sqrt{6}}$
 $\frac{2\sqrt{2} + \sqrt{12}}{4-6}$
 $\frac{2\sqrt{2} + 2\sqrt{3}}{-2} = \frac{2\sqrt{2}}{-2} + \frac{2\sqrt{3}}{-2} = -\sqrt{2} - \sqrt{3}$

3) $\frac{5}{\sqrt{10}-4} (\sqrt{10}+4)$

$$\frac{5\sqrt{10}+20}{10-16}$$

$$\frac{5\sqrt{10}+20}{-6}$$

$$\frac{-5\sqrt{10}}{6} - \frac{10}{3}$$

4) $\frac{5-\sqrt{6}}{\sqrt{2}+4} (\sqrt{2}-4)$

$$\frac{5\sqrt{2}-20-\sqrt{12}+4\sqrt{6}}{2-16}$$

$$\frac{5\sqrt{2}-20-2\sqrt{3}+4\sqrt{6}}{-14}$$

$$\frac{5\sqrt{2}}{-14} + \frac{10}{7} + \frac{\sqrt{3}}{7} - \frac{2\sqrt{6}}{7}$$

Practice: Rationalize the Denominators.

1) $\frac{\sqrt{6}}{\sqrt{20}}$

2) $\frac{3+\sqrt{2}}{\sqrt{10}}$

3) $\frac{\sqrt{6}}{4-\sqrt{8}}$

4) $\frac{2+\sqrt{5}}{\sqrt{2}-9} (\sqrt{2}+9)$

$$\frac{2\sqrt{2}+\sqrt{10}+18+9\sqrt{5}}{2-81}$$

$$\frac{2\sqrt{2}+\sqrt{10}+18+9\sqrt{5}}{-79}$$