Operations on Radicals Lesson #4:
Dividing Radicals - Part Two

handwritten: + (a+b)(a-b) conjugate ✱

Rationalizing a Denominator in Binomial Form

When the original denominator of the fraction is of binomial form, the process of rationalizing the denominator involves multiplying both numerator and denominator of the fraction by the **conjugate** of the binomial denominator.

Class Ex. #1 Simplify by rationalizing the denominator.

a) $\dfrac{2}{\sqrt{5}-\sqrt{3}}$ · $\dfrac{\sqrt{5}+\sqrt{3}}{\sqrt{5}+\sqrt{3}}$

$$= \frac{2\sqrt{5}+2\sqrt{3}}{5-3}$$

$$= \frac{2\sqrt{5}+2\sqrt{3}}{2}$$

$$= \boxed{\sqrt{5}+\sqrt{3}}$$

b) $\dfrac{\sqrt{6}-2}{\sqrt{6}+2}$ · $\dfrac{\sqrt{6}-2}{\sqrt{6}-2}$

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

$$= \frac{5\cancel{10}-4\sqrt{6}}{2}$$

$$= \boxed{5-2\sqrt{6}}$$

c) $\dfrac{1}{1-\sqrt{x}}$ · $\dfrac{1+\sqrt{x}}{1+\sqrt{x}}$

$$= \boxed{\frac{1+\sqrt{x}}{1-x}}$$

Class Ex. #2 Express $\dfrac{\sqrt{8}-\sqrt{3}}{4\sqrt{3}-\sqrt{2}}$ with a whole number in the denominator.

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

$$= \frac{8\sqrt{6}-12+4-\sqrt{6}}{48-2} = \boxed{\frac{7\sqrt{6}-8}{46}}$$

Class Ex. #3 The area of a trapezoid is given by the formula $A = \frac{1}{2}h(a+b)$ where a and b are the lengths of the parallel sides and h is the shortest distance between the sides. If the area of a trapezoid is 20 cm^2 and the parallel sides are of lengths $\sqrt{6}$ cm and $\sqrt{5}$ cm, determine the exact value of the distance between the parallel sides. Answer with a rational denominator.

Complete Assignment Questions #1 - #12

Assignment

$\boxed{\text{\#1-5 (a,c,e...), 8}}$

1. Simplify by rationalizing the denominator.

a) $\dfrac{4}{\sqrt{5}-1}$

b) $\dfrac{1}{\sqrt{6}+2}$

c) $\dfrac{3}{3-\sqrt{3}}$

d) $\dfrac{\sqrt{7}}{\sqrt{7}-2}$

e) $\dfrac{3}{\sqrt{2}-\sqrt{3}}$

f) $\dfrac{\sqrt{2}}{\sqrt{6}+\sqrt{2}}$

2. Simplify by rationalizing the denominator.

a) $\dfrac{2\sqrt{3}}{3\sqrt{2}+\sqrt{3}}$

b) $\dfrac{3\sqrt{11}}{3\sqrt{11}+10}$

c) $\dfrac{\sqrt{2}}{\sqrt{12}-\sqrt{8}}$

d) $\dfrac{\sqrt{7}}{4-\sqrt{14}}$