

Rationalizing Radical Expressions with Conjugates

Discovery — Why Conjugates Work

Multiply and simplify each pair. Then describe what happens to the radical terms when conjugates are multiplied.

1. $(3 + \sqrt{5})(3 - \sqrt{5})$ 2. $(4 + \sqrt{2})(4 - \sqrt{2})$ 3. $(\sqrt{7} + \sqrt{3})(\sqrt{7} - \sqrt{3})$

Reflection

Using an example, explain what it means to rationalize a denominator, why a conjugate works, and when rationalizing is useful.

Simple Binomial Denominators

Multiply the numerator and denominator by the conjugate of the denominator. Simplify completely.

1. $\frac{1}{2+\sqrt{3}}$ 3. $\frac{4}{5+\sqrt{6}}$ 5. $\frac{3\sqrt{13}}{2+\sqrt{13}}$ 7. $\frac{7\sqrt{10}}{4+\sqrt{10}}$
2. $\frac{12}{3-\sqrt{5}}$ 4. $\frac{6\sqrt{5}}{\sqrt{7}+2}$ 6. $\frac{5\sqrt{35}}{5-\sqrt{7}}$ 8. $\frac{10\sqrt{6}}{4-2\sqrt{6}}$

Radical–Radical Binomial Denominators

Multiply the numerator and denominator by the conjugate of the denominator. Simplify all radical products completely.

1. $\frac{1}{\sqrt{3}+\sqrt{2}}$ 3. $\frac{3}{\sqrt{7}-\sqrt{2}}$ 5. $\frac{5\sqrt{2}}{3\sqrt{2}+\sqrt{5}}$ 7. $\frac{6\sqrt{3}}{2\sqrt{6}-3\sqrt{2}}$
2. $\frac{\sqrt{2}}{2\sqrt{3}+\sqrt{2}}$ 4. $\frac{2\sqrt{3}}{\sqrt{6}+\sqrt{2}}$ 6. $\frac{7\sqrt{2}}{\sqrt{7}-\sqrt{11}}$ 8. $\frac{4\sqrt{10}}{\sqrt{3}-2\sqrt{5}}$

Variables & Mixed Strategies

Assume $x > 0$ and all denominators are non-zero. Simplify first when it makes the rationalizing easier. Rationalize the denominator and simplify completely.

1. $\frac{2}{3+\sqrt{x}}$ 3. $\frac{8}{4-\sqrt{6x}}$ 5. $\frac{3\sqrt{x}}{\sqrt{x}+\sqrt{2}}$ 7. $\frac{\sqrt{x}+1}{\sqrt{x}-1}$
2. $\frac{\sqrt{x}}{2+\sqrt{x}}$ 4. $\frac{\sqrt{5x}}{\sqrt{6x}+9}$ 6. $\frac{5\sqrt{2x}}{2\sqrt{x}-\sqrt{3}}$ 8. $\frac{6\sqrt{x}}{\sqrt{8x}+2\sqrt{x}}$