Rationalizing the Denominator: Part 1

In mathematics, it is sometimes easier to work with radical expressions if the denominator does not have any radicals.

Example 1:

\[ \frac{1}{\sqrt{2}} \]

Multiplying \( \frac{1}{\sqrt{2}} \) by \( \frac{\sqrt{2}}{\sqrt{2}} \) will eliminate the radical in the denominator:

\[ \frac{1}{\sqrt{2}} \left( \frac{\sqrt{2}}{\sqrt{2}} \right) = \frac{\sqrt{2}}{2} \]

This process of eliminating the radical in the denominator is called **Rationalizing the Denominator**.

Example 2:

Rationalize the Denominator

a.) \( \frac{4}{\sqrt{3}} \)

b.) \( \frac{\sqrt{2}}{\sqrt{6}} \)

c.) \( \frac{8}{\sqrt{x}} \)

d.) \( \frac{1}{\sqrt{3}} \)
Rationalizing the Denominator with Cube Roots

Example 3:

Rationalize the Denominator:

a.) \( \frac{2}{\sqrt[3]{5}} \)

Here, multiplying the top and the bottom by \( \sqrt[3]{5^2} \) will rationalize the denominator since: \( \sqrt[3]{5} \cdot \sqrt[3]{5^2} = \sqrt[3]{5^3} = 5 \)

\[
\frac{2}{\sqrt[3]{5}} \left( \frac{\sqrt[3]{5^2}}{\sqrt[3]{5^2}} \right) = \frac{2\sqrt[3]{5^2}}{5} = \frac{2\sqrt[3]{25}}{5}
\]

b.) \( \frac{\sqrt[3]{3}}{\sqrt[3]{4}} \)
Rationalizing the Denominator Part 1

Practice Problems

Rationalize each Denominator:

1. \( \sqrt{\frac{1}{5}} \)

2. \( \frac{9}{\sqrt{x}} \)

3. \( \frac{3\sqrt{5}}{3\sqrt{2}} \)

4. \( \frac{3\sqrt{4}}{3\sqrt{x^2}} \)