Square Root Rules

Definitions

1. $b = \sqrt{a}$ if both $b \geq 0$ and $b^2 = a$.

2. $\sqrt{a^2} = |a|$

3. If $a \geq 0$ then;

$$\sqrt{a^2} = a$$

Examples

$\sqrt{9} = 3$ because $3^2 = 9$.

$\sqrt{(-5)^2} = |-5| = 5$

$\sqrt{12^2} = 12$

Distributing ($a \geq 0$ and $b \geq 0$)

1. $\sqrt{ab} = \sqrt{a}\sqrt{b}$

2. $\sqrt{\dfrac{a}{b}} = \dfrac{\sqrt{a}}{\sqrt{b}}$ $(b \neq 0)$

3. $\sqrt{a}\sqrt{a} = a$

Examples

$\sqrt{18} = \sqrt{9 \cdot 2} = \sqrt{9} \cdot \sqrt{2} = 3\sqrt{2}$

$\sqrt{\dfrac{9}{4}} = \dfrac{\sqrt{9}}{\sqrt{4}} = \dfrac{3}{2}$

$\sqrt{10}\sqrt{10} = 10$

Careful!!

1. $\sqrt{a+b} \neq \sqrt{a} + \sqrt{b}$

2. $\sqrt{a-b} \neq \sqrt{a} - \sqrt{b}$

3. $\sqrt{a^2 + b^2} \neq a + b$

Examples

$\sqrt{6 + 10} \neq \sqrt{6} + \sqrt{10}$

$\sqrt{6 - 2} \neq \sqrt{6} - \sqrt{2}$

$\sqrt{9 + 4} \neq 3 + 2$

Rationalizing the Denominator

1. $\dfrac{a}{\sqrt{b}} = \dfrac{a}{\sqrt{b}} \cdot \dfrac{\sqrt{b}}{\sqrt{b}} = \dfrac{a\sqrt{b}}{b}$

$\dfrac{4}{\sqrt{2}} = \dfrac{4}{\sqrt{2}} \cdot \dfrac{\sqrt{2}}{\sqrt{2}} = \dfrac{4\sqrt{2}}{2} = 2\sqrt{2}$

Another Example:

$\dfrac{10}{2\sqrt{5}} \cdot \dfrac{\sqrt{5}}{\sqrt{5}} = \dfrac{10\sqrt{5}}{2 \cdot 5} = \dfrac{10\sqrt{5}}{10} = \sqrt{5}$