8.2

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10:58 AM

Properties of Radicals

Assume we are always in the reals. (ie no even roots of neg. no dividing by zero)

multiplication of radicals

$$\sqrt[n]{ab} = \sqrt[n]{a}\,\sqrt[n]{b}$$

ex) $\sqrt{9\cdot 4} =$ 6

$\sqrt{9}\cdot\sqrt{4} =$ 6

note: this is NOT true for add/subt.

ex) $\sqrt{9}+\sqrt{4} \neq \sqrt{9+4}$

$3+2 \neq \sqrt{13}$

$5 \neq \sqrt{13}$

ex) $\sqrt{25x} = \sqrt{25}\sqrt{x} = 5\sqrt{x}$

ex) $\sqrt{3x}\,\sqrt{2y} =$

Division of radicals

$$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$$

ex) $\sqrt{1/4} = 1/2$

$\sqrt{x/16} = \sqrt{x}/4$

$$\frac{\sqrt{32x^3}}{\sqrt{2x}} = \sqrt{\frac{32x^3}{2x}} = \sqrt{16x^2} = \sqrt{16}\sqrt{x^2} = 4x$$

Simplifying Radical Expressions

A radical is simplified when

All Powers in radicand are less than the index
(factor out whatever you can)

ex. Simplify. $\sqrt{20} = \sqrt{4*5} = \sqrt{4} * \sqrt{5}$

$\cancel{\sqrt{2*10}}$

$= 2\sqrt{5}$

$\sqrt[3]{40} = \sqrt[3]{8*5} = \sqrt[3]{8}\sqrt[3]{5}$

$= 2\sqrt[3]{5}$

$\sqrt{200} = \sqrt{100*2} = \sqrt{100}\sqrt{2}$

$= 10\sqrt{2}$

$\sqrt{20*10} = \sqrt{4*5}\sqrt{10}$

$= \sqrt{4}\sqrt{5}\sqrt{10} = 2\sqrt{5}\sqrt{10} = 2\sqrt{5*10} = 2\sqrt{50}$

$= 2\sqrt{25*2} = 2*5\sqrt{2}$

$10\sqrt{2}$

$\sqrt[2]{x^{17}} = \sqrt{x^{16}x^{1}}$

$= \sqrt{(x^8)^2 x^1} = \sqrt{(x^8)^2}\sqrt{x}$

$= x^8\sqrt{x}$

$\sqrt{162x^5} =$

$\sqrt{81*2\ x^5} = \sqrt{81}\sqrt{2x^5} = 9\sqrt{2x^5}$

$= 9\sqrt{2x^4x} = 9\sqrt{2(x^2)^2x}$

$= 9\sqrt{(x^2)^2}\sqrt{2x}$

$= 9x^2\sqrt{2x}$