5.1 notes

Tuesday, March 10, 2020 1:10 PM

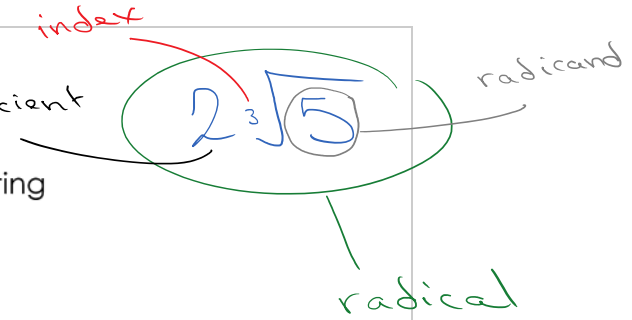
$2x + 3x = 5x$

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

$2\sqrt{x} + 3\sqrt{y} = 2\sqrt{x} + 3\sqrt{y}$

PreCalc 11

5.1-Working with Radicals
Simplifying, Adding and Subtracting



Entire Radicals: $\sqrt[y]{x}$ Mixed Radicals: $m\sqrt[y]{x}$

In general, $m\sqrt[x]{y} + n\sqrt[x]{y} = (m+n)\sqrt[x]{y}$.

m and n: coefficients x: index, y: radicand

Perfect Square Numbers: we cannot take an **even root** of a negative radicand ex $\sqrt{-4}$ or $\sqrt[4]{-2}$

1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, ...

Perfect Cube Numbers: we can take an **odd root** of a negative radicand.

1, 8, 27, 64, 125, ... ex $\sqrt[3]{-8} = -2$ or $\sqrt[5]{-32} = -2$

Express each radical as a **mixed** radical.

find the biggest perfect root that goes into radicand

$\sqrt{200}$
$= \sqrt{100}\sqrt{2}$
$= 10\sqrt{2}$

$\sqrt[3]{24}$
$= \sqrt[3]{8} \cdot \sqrt[3]{3}$
$= 2\sqrt[3]{3}$

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

$\sqrt{x^3}$
$= \sqrt{x^2}\sqrt{x}$
$= x\sqrt{x}$

$\sqrt[3]{x^7}$
$= \sqrt[3]{x^3 \cdot x^3 \cdot x}$
$= x \cdot x \sqrt[3]{x}$
$= x^2\sqrt[3]{x}$

$\sqrt{12x^5y^3}$
$= \sqrt{2 \cdot 2 \cdot 3 \cdot x^2 \cdot x^2 \cdot x \cdot y^2 \cdot y}$
$= 2x^2y\sqrt{3xy}$

$3\sqrt[3]{24x^8y^5}$
$= 3\sqrt[3]{2 \cdot 2 \cdot 2 \cdot 3 \cdot x^6 \cdot x^2 \cdot y^3 \cdot y^2}$
$= 3 \cdot 2x^2y\sqrt[3]{3x^2y^2}$
$= 6x^2y\sqrt[3]{3x^2y^2}$

Convert each radical to an **entire** radical.

convert coefficient into radical to multiply with like radical.

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

$-2\sqrt{5}$
$= -\sqrt{4}\sqrt{5}$
$= -\sqrt{20}$

$x^3\sqrt{x^3}$
$= \sqrt{x^6}\sqrt{x^3}$
$= \sqrt{x^9}$

When adding or subtracting radicals, combine the coefficients of **like** radicals.

same index & radicand!

When adding or subtracting radicals, combine the coefficients of **like** radicals. (same index & radicand)

$7x + 5x = 12x$ $\quad 7\sqrt{3} + 5\sqrt{3} = 12\sqrt{3}$ $\quad 7\sqrt{x} + 5\sqrt{x} = 12\sqrt{x}$

Simplify and **combine like terms** in the following expressions.

$2\sqrt{7} + 13\sqrt{7}$

$= 15\sqrt{7}$

$3\sqrt{2} + 3\sqrt{8}$

$= 3\sqrt{2} + 3 \cdot 2\sqrt{2}$

$= 3\sqrt{2} + 6\sqrt{2}$

$= 9\sqrt{2}$

$\sqrt{8} = \sqrt{4}\sqrt{2} = 2\sqrt{2}$

$2\sqrt{40} + \sqrt{90}$

$= 2 \cdot 2\sqrt{10} + 3\sqrt{10}$

$= 4\sqrt{10} + 3\sqrt{10}$

$= 7\sqrt{10}$

$\sqrt{40} = \sqrt{4}\sqrt{10} = 2\sqrt{10}$

$\sqrt{90} = \sqrt{9}\sqrt{10} = 3\sqrt{10}$

$\sqrt{80} + 2\sqrt{5} + \sqrt{20} - \sqrt{12}$

$= 4\sqrt{5} + 2\sqrt{5} + 2\sqrt{5} - 2\sqrt{3}$

$= 8\sqrt{5} - 2\sqrt{3}$

$\sqrt{80} = \sqrt{16}\sqrt{5} = 4\sqrt{5}$

$\sqrt{20} = \sqrt{4}\sqrt{5} = 2\sqrt{5}$

$\sqrt{12} = \sqrt{4}\sqrt{3} = 2\sqrt{3}$

$4\sqrt{32x^2} - 2\sqrt{18x^4}$

$= 4 \cdot 4x\sqrt{2} - 2 \cdot 3x^2\sqrt{2}$

$= 16x\sqrt{2} - 6x^2\sqrt{2}$ ←

$= (16x - 6x^2)\sqrt{2}$ ←

or...

$= (2x)(8 - 3x)\sqrt{2}$ ←

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

$\sqrt{18x^4} = \sqrt{9 \cdot 2 x^4} = 3x^2\sqrt{2}$

$\sqrt[3]{24} + \sqrt[3]{81} + \sqrt[3]{16}$

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

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

$\sqrt[3]{24} = \sqrt[3]{8}\sqrt[3]{3} = 2\sqrt[3]{3}$

$\sqrt[3]{81} = \sqrt[3]{27}\sqrt[3]{3} = 3\sqrt[3]{3}$

$\sqrt[3]{16} = \sqrt[3]{8}\sqrt[3]{2} = 2\sqrt[3]{2}$

$3\sqrt[3]{8x^2y^6} - x\sqrt[3]{x^5} + y\sqrt[3]{125x^2y^3}$

$= 3 \cdot 2y^2\sqrt[3]{x^2} - x \cdot x\sqrt[3]{x^2} + y \cdot 5y\sqrt[3]{x^2}$

$= 6y^2\sqrt[3]{x^2} - x^2\sqrt[3]{x^2} + 5y^2\sqrt[3]{x^2}$

$= 11y^2\sqrt[3]{x^2} - x^2\sqrt[3]{x^2}$

$= \boxed{(11y^2 - x^2)\sqrt[3]{x^2}}$

$\sqrt[3]{8x^2y^6} = 2y^2\sqrt[3]{x^2}$

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

$\sqrt[3]{125x^2y^3} = 5y\sqrt[3]{x^2}$

HW: p 278 Questions: 1-3, 5(express answers as mixed radicals), 8acd, 9ab, 10ab, 17

Ignore the restriction on the variables in the radicand, we will do this in 5.3 graphing radical equations.