$\sqrt{81x^2y^6z^8}$

$\sqrt{16x^4y^2}$

$= \sqrt{16}\sqrt{x^4}\sqrt{y^2} = 4|x|^2|y| = 4x^2|y|$

I say "assume real, but don't assume variables are nonnegative."

$|x|^2 = x^2$

$|x|^{even} = x^{even}$

$\sqrt{z^6} = |z|^3$

$|z|^{odd}$ can't drop absolute values.

$\sqrt{x^5}$ If I say this is Real then $x \geq 0$ must be the case.

$\sqrt{(-2)^5} = \sqrt{-32}$ ain't real!

If I say $\sqrt{x^6}$ is real, then I'm not restricting x at all.

$\sqrt{\frac{27x^3}{25y}}$

Assume it's real: Then $x \geq 0$ & $y \geq 0$, because they're taken to odd powers.

$\sqrt{\frac{36x}{8y^3}}$

$2 \mid 8$
$2 \mid y$
2

$= \frac{\sqrt{36}\sqrt{x}}{\sqrt{8}\sqrt{y^3}} = \frac{6\sqrt{x}}{2\sqrt{2}y\sqrt{y}}$

$y^3 = y^{2+1}$
$= y^2 y^1$
$\sqrt{y^2 y^1} = \sqrt{y^2}\sqrt{y}$
$= y\sqrt{y}$, since $y \geq 0$

$= \frac{6\sqrt{x}}{2y\sqrt{2y}}$ Rationalize Denominator.

$= \frac{6\sqrt{x}}{2y\sqrt{2y}} \cdot \frac{\sqrt{2y}}{\sqrt{2y}} = \frac{6\sqrt{2xy}}{2y \cdot 2y} = \boxed{\frac{6\sqrt{2xy}}{4y^2}}$

$\sqrt{2y}\sqrt{2y} = 2y$

$$\sqrt[3]{\frac{36x^5}{125y^4}}$$

$2 \mid 36$
$2 \mid 18$
$3 \mid 9$
3

$$= \frac{\sqrt[3]{36}\sqrt[3]{x^5}}{\sqrt[3]{125}\sqrt[3]{y^4}} = \frac{\sqrt[3]{36}\; x\sqrt[3]{x^2}}{5y\sqrt[3]{y}}$$

$x^5 = x^{3+2} = x^3x^2$

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

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

$y^4 = y^{3+1} = y^3y^1$

$$= \frac{x\sqrt[3]{36x^2}}{5y\sqrt[3]{y}} \cdot \underbrace{\frac{\sqrt[3]{y^2}}{\sqrt[3]{y^2}}}_{y} = \frac{x\sqrt[3]{36x^2y^2}}{5y \cdot y}$$

$$= \boxed{\frac{x\sqrt[3]{36x^2y^2}}{5y^2}}$$

Domain for general purposes.

(1) Can't have a negative under a square root.

$f(x) = \sqrt{\text{stuff}} \Rightarrow$ Need stuff ≥ 0

$f(x) = \sqrt{2x-17} \Rightarrow$ Need $2x-17 \geq 0$

$2x \geq 17$

$D = \{x \mid x \geq \frac{17}{2}\}$

$= [\frac{17}{2}, \infty)$

(2) Can't Divide by zero.

$f(x) = \frac{\text{cool}}{\text{stuff}} \Rightarrow$ Need stuff $\neq 0$

$f(x) = \frac{2x-1}{x^2-5x-6}$ Need stuff $\neq 0$

$x^2-5x-6 \neq 0$

$(x-6)(x+1) \neq 0$

$x-6 \neq 0$ AND $x+1 \neq 0$

$x \neq 6$ AND $x \neq -1$

Recall

$x^2-5x-6=0$

$(x-6)(x+1)=0$

$x=6$ OR $x=-1$

Logic

NOT (THIS OR THAT)

= NOT THIS AND NOT THAT

NOT (Blue or gold)

= Not Blue & not gold.

$$\frac{\left(x^{-2}y^{3}\right)^{1/8}}{\left(x^{-3}y\right)^{-1/4}}$$

$$\frac{\left(x^{5}y^{4}\right)^{\frac{1}{6}}}{\left(x^{3}y^{-5}\right)^{-1/4}}$$

$5 \cdot \frac{1}{6} = \frac{5}{6}$

$4 \cdot \frac{1}{6} = \frac{4}{6} = \frac{2}{3}$

$$= \frac{x^{5/6}\,y^{2/3}}{x^{-3/4}\,y^{5/4}} = x^{5/6+3/4}\,y^{2/3-5/4} = x^{\frac{19}{12}}\,y^{-\frac{7}{12}}$$

$$= \frac{x^{19/12}}{y^{7/12}}$$

Scratch: $\frac{5}{6}\cdot\frac{2}{2} + \frac{3}{4}\cdot\frac{3}{3} = \frac{10+9}{12} = \frac{19}{12}$

$2 \cdot 3$ $\quad$ $2 \cdot 2$

LCD $= 2 \cdot 2 \cdot 3$

$$\frac{2}{3}\cdot\frac{4}{4} - \frac{5}{4}\cdot\frac{3}{3} = \frac{8-15}{12} = -\frac{7}{12}$$

Can you write $x^{\frac{19}{12}}$ in radical form?

$$\sqrt[12]{x^{19}} = \left(\sqrt[12]{x}\right)^{19}$$

$$x^{\frac{m}{n}} = \sqrt[n]{x^{m}}$$

$$\frac{\sqrt[3]{x^5}}{8}+\frac{5x\sqrt[3]{x^2}}{4}$$

$$\frac{\sqrt[5]{x^7}}{16}+\frac{3x\sqrt[5]{x^2}}{4} \qquad \text{LCD}=16$$

$$=\frac{x\sqrt[5]{x^2}}{16}+\frac{3x\sqrt[5]{x^2}}{4}\cdot\frac{4}{4}=\frac{x\sqrt[5]{x^2}+12x\sqrt[5]{x^2}}{16}=\boxed{\frac{13x\sqrt[5]{x^2}}{16}}$$

$$\sqrt[5]{x^7}=\sqrt[5]{x^5x^2}$$

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

$$\sqrt[3]{x^{35}}=\sqrt[3]{x^{33+2}}$$

$$\sqrt[3]{x^{33}}\sqrt[3]{x^2}=x^{11}\sqrt[3]{x^2}$$

✗ No Solution

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

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

$\left(\sqrt{x-3}\right)^2 = (x-2)^2$

$x-3 = x^2-4x+4$

$x^2-4x+4 = x-3$

$x^2-5x+4 = -3$

$x^2-5x+7 = 0$

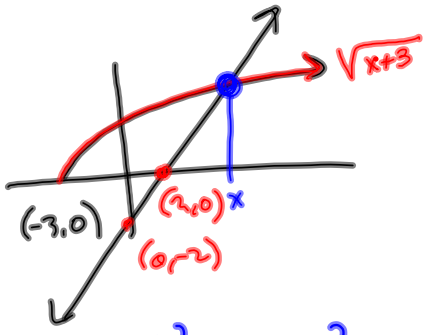
$a=1, b=-5, c=7$

$b^2-4ac = (-5)^2-4(1)(7)$

$= 25-28 = -3$

No Real Solution

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



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

$x+3 = (x-2)^2 = x^2 - 2\cdot 2x + 2^2 = x^2 - 4x + 4$

$x^2 - 4x + 4 = x + 3$

$x^2 - 5x + 1 = 0$

$a=1, b=-5, c=1$

$b^2 - 4ac = (-5)^2 - 4(1)(1)$

$= 25 - 4$

$= 21$

$x = \frac{5 \pm \sqrt{21}}{2} = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$x = \frac{5+\sqrt{21}}{2}$