Rationalizing . . .

(1) ... Denominators – for desert island arithmetic.
(2) ... Numerators – for calculus.

$\sqrt{2} \approx 1.414$

Consider $\frac{1}{\sqrt{2}}$ $\quad 1.414\overline{)1.000000}$ owie!

$.707 \approx \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$

$$\begin{array}{r} .707 \\ 2\overline{)1.414} \\ -\ 1.4 \\ \hline .014 \\ .014 \\ \hline 0 \end{array}$$

(2) $\frac{\sqrt{x+h} - \sqrt{x}}{h}$ In Calc, we want $h \to 0$, but h is all alone, downstairs. $h \neq 0$!

$(a-b)(a+b) = a^2 - b^2$

$$\frac{\sqrt{x+h} - \sqrt{x}}{h} \cdot \frac{\sqrt{x+h} + \sqrt{x}}{\sqrt{x+h} + \sqrt{x}}$$

Nice agg Bonus!

$$= \frac{(\sqrt{x+h})^2 - (\sqrt{x})^2}{h(\sqrt{x+h} + \sqrt{x})} = \frac{x+h-x}{h(\sqrt{x+h} + \sqrt{x})}$$

$$= \frac{\cancel{h}^{\,1}}{\cancel{h}_{\,1}(\sqrt{x+h} + \sqrt{x})} = \boxed{\frac{1}{\sqrt{x+h} + \sqrt{x}}} \xrightarrow{h \to 0} \frac{1}{\sqrt{x} + \sqrt{x}}$$

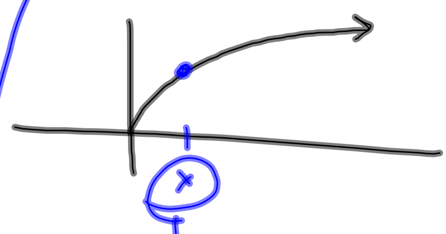
$$\frac{3}{1+\sqrt{2}} \qquad \frac{3}{1+\sqrt{2}} \cdot \frac{1-\sqrt{2}}{1-\sqrt{2}}$$

$$= \frac{3(1-\sqrt{2})}{1^2 - \sqrt{2}^2} = \frac{3-3\sqrt{2}}{1-2}$$

$$= \frac{3-3\sqrt{2}}{-1}$$

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

$= \frac{1}{2\sqrt{x}}$ is the derivative of $\sqrt{x}$!
It tells you how steep $\sqrt{x}$ is!



§7.5 Rationalize the denominator:

#40 $\dfrac{\sqrt{3}+\sqrt{4}}{\sqrt{2}-\sqrt{3}} \cdot \dfrac{\sqrt{2}+\sqrt{3}}{\sqrt{2}+\sqrt{3}} = \dfrac{\sqrt{6}+3+2\sqrt{2}+2\sqrt{3}}{-1}$

$2 \lfloor 8$
$2 \lfloor 4$
2

$(\sqrt{2})^2-(\sqrt{3})^2$

$(\sqrt{3}+\sqrt{4})(\sqrt{2}+\sqrt{3}) = \sqrt{6}+\sqrt{9}+\sqrt{8}+\sqrt{12}$

$2 \lfloor 12$
$2 \lfloor 6$
3

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

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

§7.6 Radical Equations

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

$\left(\sqrt{2x-3}\right)^2 = 5^2$

$2x-3 = 25$

$2x = 28$

$x = 14$

$x =$ summ'm

Always check these.
You're casting a net,
you may have to throw
some fish back.

$\sqrt{2(14)-3} = \sqrt{25} = 5$ ✓

$\sqrt{2x-3} - 5 = 0$

$\sqrt{2x-3} = 5$, etc.

$|2x-3| - 5 = 0$

$|2x-3| = 5$

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

$$(a-b)^2 = a^2-2ab+b^2$$

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

$$2x-3 = x^2-6x+9$$

$$x^2-8x+12=0$$

$$(x-2)(x-6)=0$$

$x=2$ OR $\boxed{x=6}$

$$\sqrt{2(2)-3} = 2-3 \ ?$$

$\sqrt{1} = 1 = -1$ Heck no!

$$\sqrt{2(6)-3} = 6-3 \ ?$$

$$\sqrt{9} = 3 \ !$$

No! $x=2$ is extraneous solution.

usually our algebra moves are bi-directional

$3x+2=5 \Longleftrightarrow$ $3x = 3$

$3x = 3 \Longrightarrow$ $3x+2=5$

If $A=B$, then $A^2=B^2$

$A=B \Longrightarrow A^2=B^2$

But: $A^2=B^2$ does NOT imply $A=B$

$(-3)^2=9$

$3^2=9$

$(-3)^2=(3)^2$, but $-3 \neq 3$

So that's why we get solutions that don't check out.

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) § 7.6 #s to go lightly...

#s 29, 30, 33-36, 41, 42

Master the square roots & the rest will come, if needed.

How about when there's more than one square root?

#20 $\sqrt{x+3} + \sqrt{x-5} = 3$

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

$(\sqrt{x+3})^2 = (3 - \sqrt{x-5})^2$

$x+3 = 9 - 2(3)\sqrt{x-5} + x - 5$

$x + 3 = 9 - 6\sqrt{x-5} + x - 5$

$3 = 4 - 6\sqrt{x-5}$

$6\sqrt{x-5} = +6\sqrt{x-5}$

$6\sqrt{x-5} + 3 = 4$

$6\sqrt{x-5} = 1$

$(6\sqrt{x-5})^2 = 1^2$

$36(x-5) = 1$

$36x - 180 = 1$

$36x = 181$

$\boxed{x = \frac{181}{36}}$

$(3x-2y)^2 = 9x^2 - 12xy + 4y^2$

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

$\sqrt{\frac{181}{36} + \frac{108}{36}} + \sqrt{\frac{181}{36} - \frac{180}{36}}$

$= \sqrt{\frac{289}{36}} + \sqrt{\frac{1}{36}}$

$= \frac{17}{6} + \frac{1}{6} = \frac{18}{6} = 3$ Sweet!

Quiz Wednesday

One more quiz next week.