§ 6.1 #s 1-74 odds are good practice.
Do as many as needed.

Recall
Rational Numbers = $\mathbb{Q} = \{ \frac{a}{b} \mid a, b \in \mathbb{Z}, \text{ and } b \neq 0 \}$

Rational Functions =

$= \{ \frac{P(x)}{q(x)} \mid P, q \text{ are polynomials and } q(x) \neq 0 \}$

Domain of a rational function $R(x) = \frac{P(x)}{q(x)}$

$= \{ x \mid R(x) \text{ is a real number} \}$

$= \{ x \mid R(x) \in \mathbb{R} \}$

$= \{ x \mid q(x) \neq 0 \}$

Ex $R(x) = \frac{x^2 - 5x + 6}{x - 2} \Rightarrow \mathcal{D} = \{ x \mid x - 2 \neq 0 \}$

$= \{ x \mid x \neq 2 \}$

Lowest terms:

$\frac{12}{10} = \frac{2 \cdot 2 \cdot 3}{2 \cdot 5} = \frac{6}{5}$

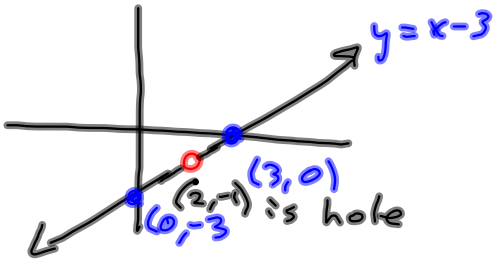
$R(x) = \frac{x^2 - 5x + 6}{x - 2} = \frac{(x-2)(x-3)}{(x-2)} = x - 3, \; x \neq 2$

Reminds us it started with x-2 downstairs.

$R(x) = x - 3$, with a hole at $x = 2$

$2 - 3 = -1$

$(2, -1)$ is the hole.



We did multiplication and division

Today, Adding & Subtracting:

LCD is the LCM of the denominators.

Find LCD & then add.

$\frac{3}{10} + \frac{7}{15}$

$2\overline{)10}\ \ 3\overline{)15}$
$\ \ 5\ \ \ \ \ 5$

$LCD = 2 \cdot 3 \cdot 5$

$= \frac{3}{2 \cdot 5} \cdot \frac{3}{3} + \frac{7}{3 \cdot 5} \cdot \frac{2}{2}$

$= \frac{9 + 14}{LCD} = \boxed{\frac{23}{2 \cdot 3 \cdot 5}} = \frac{23}{30}$ pat on the head

↳ §6.2 wants you to stop, here.

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§6.2 you have to factor trinomials all over the place. So here's your Ford hammer. We've been factoring to solve

$x^2 - 5x + 6 = 0 \Rightarrow (x-2)(x-3) = 0$

$\Rightarrow x - 2 = 0$ OR $x - 3 = 0$

$\Rightarrow x = 2$ OR $x = 3$

We can JUST as easily reason backwards from the zeros (roots) to how the polynomial factors. FACTOR THEOREM MAT 121

If I tell you that $x^2 - 3x + 2 = 0$ when $x = 1$ OR $x = 2$, then you KNOW

$x^2 - 3x + 2 = (x-1)(x-2)$

i.e. $x = 1$ is a zero $\Rightarrow (x-1)$ is a factor.

You can use the quadratic formula to factor!

Find LCD and Add

$$\frac{2x}{x^2+8x+16} + \frac{7x}{x^2+x-12}$$

$a=1, b=8, c=16$

$b^2-4ac = 8^2-4(1)(16)$

$= 64-64$

$= 0$

$x = \frac{-8 \pm \sqrt{0}}{2(1)}$

$x = -\frac{8}{2} = -4$

and $x=-4$ is "repeated"

$x-(-4) = x+4$ is a factor.

$a=1, b=1, c=-12$

$b^2-4ac = 1^2-4(1)(-12)$

$= 1+48$

$= 49$

$x = \frac{-1 \pm \sqrt{49}}{2(1)}$

$x = \frac{-1 \pm 7}{2}$

$3 = x$

$-4 = x$

So, $x^2+x-12 = (x-3)(x+4)$

$$\frac{2x}{(x+4)(x+4)} \cdot \frac{x-3}{x-3} + \frac{7x}{(x-3)(x+4)} \cdot \frac{x+4}{x+4}$$

So,

LCD = $(x+4)(x+4)(x-3)$

$$= \frac{2x(x-3) + 7x(x+4)}{LCD}$$

$$= \frac{2x^2-6x+7x^2+28x}{LCD}$$

$$= \boxed{\frac{9x^2+22x}{(x+4)^2(x-3)}}$$

$$\frac{2}{x-4} + \frac{5}{4-x}$$

See Example 3c

Think of $4-x$ as $-(-4+x)$ $= -(x-4)$

$$= \frac{2}{x-4} + \frac{5}{-(x-4)}$$

$$= \frac{2}{x-4} + \frac{-5}{x-4}$$

$$= \frac{2}{x-4} - \frac{5}{x-4}$$

$$= \frac{2-5}{x-4}$$

$$= \frac{-3}{x-4}$$

$$\frac{x+3}{5x^2+12x+4} + \frac{6}{x^2-x-6}$$

$(x-3)(x+2)$

LCD = $(5x+2)(x-3)(x+2)$

Magic: $(5)(4)=20$

$= 11+1 \quad (11)(1)=22$

$= 10+2 \quad (10)(2)=20$

$5x^2+10x+2x+4$

$= 5x(x+2)+2(x+2)$

$= (x+2)(5x+2)$

$= \frac{x+3}{(5x+2)(x+2)} \cdot \frac{x-3}{x-3} + \frac{6}{(x+2)(x-3)} \cdot \frac{5x+2}{5x+2}$

$= \frac{(x+3)(x-3)+6(5x+2)}{LCD}$

$= \frac{x^2-9+30x+12}{LCD}$

$= \boxed{\frac{x^2+30x+3}{(5x+2)(x+2)(x-3)}}$

$a=5, b=12, c=4$

$b^2-4ac = 12^2-4(5)(4)$

$= 144-80$

$= 64$

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

$= \frac{-12 \pm \sqrt{64}}{2(5)}$

$= \frac{-12 \pm 8}{10}$ → $\frac{-4}{10} = -\frac{2}{5}$, $\frac{-20}{10} = -2$

So $5x^2+12x+4 =$

$5\left(x-\left(-\frac{2}{5}\right)\right)(x-(-2))$

$= 5\left(x+\frac{2}{5}\right)(x+2)$

$= (5x+2)(x+2)$

$5\left(\frac{2}{5}\right) = \left(\frac{5}{1}\right)\left(\frac{2}{5}\right) = 2$