

Write in a neat and organized fashion. You should use a pencil. For an exercise to be complete there needs to be a detailed solution to the problem. Do not just write down an answer. No proof, no credit given.

1. Divide using long division:

$$\frac{9x^3 - 3x^2 - 3x + 4}{3x + 2} = \boxed{3x^2 - 3x + 1 + \frac{2}{3x + 2}}$$

$$\begin{array}{r} 3x^2 - 3x + 1 \\ 3x + 2 \overline{) 9x^3 - 3x^2 - 3x + 4} \\ \underline{-9x^3 - 6x^2} \\ -9x^2 - 3x + 4 \\ \underline{9x^2 + 6x} \\ -3x + 4 \\ \underline{-3x - 2} \\ 2 \end{array}$$

2. Solve or simplify, whichever is appropriate:

a) $\frac{x+2}{x^2-x} - \frac{6}{x^2-1} = 0$

$$\frac{x+1}{x(x-1)} - \frac{x}{(x-1)(x+1)} = 0$$

Conditions: $\begin{cases} x \neq 0 \\ x \neq \pm 1 \end{cases}$

LCD = $x(x-1)(x+1)$

$(x+1)(x+2) - 6x = 0$

$x^2 - 3x + 2 = 0$

$(x-2)(x-1) = 0$
 $x = 2$ OR $x = 1$
 not possible

Solution set = {2}

b) $\frac{x^2}{x^2-16} \div \frac{x^2+3x}{x^2+7x+12} =$

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

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

c) $\frac{1}{x^3-8} + \frac{3}{(x-2)(x^2+2x+4)} = \frac{2}{x^2+2x+4}$

$\frac{1}{x^3-2^3} + \frac{3}{(x-2)(x^2+2x+4)} = \frac{2}{x^2+2x+4}$

$\frac{1}{(x-2)(x^2+2x+4)} + \frac{3}{(x-2)(x^2+2x+4)} = \frac{2}{x^2+2x+4}$

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

Conditions: $x \neq 2$

LCD = $(x-2)(x^2+2x+4)$

$4 = 2(x-2)$
 $4 = 2x - 4$
 $8 = 2x$

$x = 4$

Solution set = {4}

3. You can wash the car in 45 minutes and your sister claims she can do the job in 30 minutes. If you work together, how long will it take to do the job?

	Time to complete the job	Part of job done per minute
You	45 min	$\frac{1}{45}$
Your sister	30 min	$\frac{1}{30}$
Together	x min	$\frac{1}{x}$

Let $x = \#$ minutes it takes you both to wash the car.

$$\frac{1}{x} = \frac{2}{45} + \frac{3}{30}$$

$$\text{LCD} = 90$$

$$\frac{1}{x} = \frac{2+3}{90}$$

$$\frac{1}{x} = \frac{5}{90} \Rightarrow x = \frac{90}{5}$$

$$x = 18 \text{ minutes}$$

It takes you both 18 min.

4. In still water, a boat averages 8 miles per hour. It takes the same amount of time to travel 30 miles downstream, with the current, as 18 miles upstream, against the current. What is the rate of the water's current?

	distance	rate	time
downstream	30 mi	$8+x$	same
upstream	18 mi	$8-x$	

Let $x = \text{rate of current}$

$$\text{time} = \frac{\text{distance}}{\text{rate}}$$

$$\frac{30}{8+x} = \frac{18}{8-x}$$

$$\frac{5}{8+x} = \frac{3}{8-x}$$

$$5(8-x) = 3(8+x)$$

$$40 - 5x = 24 + 3x$$

$$16 = 8x$$

$$x = 2 \text{ mi/h}$$

The rate of current is 2 mi/h

5. Solve each formula for the specified variable:

a) $\frac{1}{p} + \frac{1}{q} = \frac{1}{f}$ for f .

$$\frac{q+p}{pq} = \frac{1}{f} \Rightarrow$$

$$f = \frac{pq}{p+q}$$

b) $z = \frac{x-\bar{x}}{s}$ for x .

$$zs = x - \bar{x}$$

$$x = \bar{x} + zs$$