

Chapter 11 Test

$$\begin{aligned}
 1) \quad & \frac{5}{x+2} + \frac{1}{x+3} \\
 &= \frac{5(x+3)}{(x+2)(x+3)} + \frac{1(x+2)}{(x+3)(x+2)} \\
 &= \frac{5x+15}{(x+2)(x+3)} + \frac{x+2}{(x+3)(x+2)} \\
 &= \frac{5x+15+x+2}{(x+2)(x+3)} \\
 &= \frac{6x+17}{(x+2)(x+3)}
 \end{aligned}$$

$$\begin{aligned}
 3) \quad & \frac{x^2 - x}{x^2} \cdot \frac{(x+1)^2}{x^2 - 1} \\
 &= \frac{x(x-1)}{x^2} \cdot \frac{(x+1)(x+1)}{(x-1)(x+1)} \\
 &= \frac{x(x-1)(x+1)(x+1)}{x^2(x-1)(x+1)} \\
 &= \frac{(x+1)x(x-1)(x+1)}{x(x-1)(x+1)} \\
 &= \frac{x+1}{x}
 \end{aligned}$$

5) Graph is shifted 1 unit to the right.

7) Domain = $\{x : x \geq 0\}$ Range = $\{y : y \geq 2\}$

9) Let x be the time (in hrs) it takes for Ron to do the job alone.

	Work	Time	Rate
Lynn	1 job	5 hrs	$\frac{1}{5} \frac{\text{job}}{\text{hr}}$
Ron	1 job	x hrs	$\frac{1}{x} \frac{\text{job}}{\text{hr}}$
Together	1 job	$3\frac{1}{3} = \frac{10}{3}$ hrs	$\frac{3}{10} \frac{\text{job}}{\text{hr}}$

$$\begin{aligned}
 \frac{1}{5} + \frac{1}{x} &= \frac{3}{10} \\
 \frac{1}{5} \cdot \frac{x}{x} + \frac{1}{x} \cdot \frac{5}{5} &= \frac{3}{10}
 \end{aligned}$$

$$\frac{x}{5x} + \frac{5}{5x} = \frac{3}{10}$$

$$\frac{x+5}{5x} = \frac{3}{10}$$

$$10(x+5) = 3(5x)$$

$$10x + 50 = 15x$$

$$50 = 5x$$

$$x = 10$$

It takes Ron 10 hrs to complete the job working alone.

- 11) Let x represent the speed of the boat ($\frac{\text{mi}}{\text{hr}}$) in still water. Since the river current is $3 \frac{\text{mi}}{\text{hr}}$, the speed of the boat is $(x - 3) \frac{\text{mi}}{\text{hr}}$ when it travels upstream and it is $(x + 3) \frac{\text{mi}}{\text{hr}}$ when it travels downstream.

$$\text{Time} = \frac{\text{Distance}}{\text{Rate}}$$

The time it takes for the boat to travel downstream is $\frac{24 \text{ mi}}{(x + 3) \frac{\text{mi}}{\text{hr}}} = \frac{24}{x + 3}$ hrs .

The time it takes for the boat to return upstream is $\frac{24 \text{ mi}}{(x - 3) \frac{\text{mi}}{\text{hr}}} = \frac{24}{x - 3}$ hrs .

The total time of travel is 6 hrs. Thus we have

$$\frac{24}{x + 3} + \frac{24}{x - 3} = 6$$

$$\frac{24(x - 3)}{(x + 3)(x - 3)} + \frac{24(x + 3)}{(x - 3)(x + 3)} = 6$$

$$24(x - 3) + 24(x + 3) = 6(x + 3)(x - 3)$$

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

$$4x - 12 + 4x + 12 = x^2 - 9$$

$$8x = x^2 - 9$$

$$x^2 - 8x - 9 = 0$$

← Diagonal product = $-9x^2$

$$x^2 - 9x + 1x - 9 = 0$$

← Split the middle term: $-9x + 1x = -8x$

$$(x^2 - 9x) + (1x - 9) = 0$$

← Group the terms

$$x(x - 9) + 1(x - 9) = 0$$

← Factor of GCF of each group

$$(x + 1)(x - 9) = 0$$

← Factor out common binomial

$$x + 1 = 0 \text{ or } x - 9 = 0$$

← Zero factor property

$$x = -1 \text{ or } x = 9$$

Since x represents speed, we ignore the negative root. The speed of the boat is $9 \frac{\text{mi}}{\text{hr}}$ in still water.

- 13) Let V and P be the volume of and pressure upon the gas, respectively. We have

$$V = \frac{a}{P}$$

$$(4) = \frac{a}{(1.06)}$$

← Volume is 4L when pressure is 1.06 atm

$$a = (1.06)(4) = 4.24$$

← Find variation constant first

$$V = \frac{4.24}{P}$$

$$V(1) = \frac{4.24}{(1)}$$

$$V(1) = 4.24 \text{ L}$$