HW 7E: 4, 5, 6

4.) $y \propto \frac{1}{x}$?

a.) $(1,10), (2,5), (5,2)$

$1 \times 10 = 2 \times 5 = 5 \times 2 = 10$ ✓ **Yes**

b.) $y = \frac{k}{x}$ $\therefore 10 = \frac{k}{1}$ $\therefore k = 10$ (plugged in $(1,10)$)

$\therefore \boxed{y = \frac{10}{x}}$

c.) $y = \frac{10}{8} = \boxed{\frac{5}{4}}$ or $\boxed{1.25}$

5.) If the model has the form $y = \frac{k}{x^2}$ then $x^2 y = k$ for all points

$\therefore (0.25)^2 \times 80 = (0.5)^2 (20) = (1)^2 (5) = (2)^2 (1.25)$ $\therefore \boxed{k = 5}$

$\Rightarrow 0.625 \times 80 = 0.25 \times 20 = 1 \times 5 = 4 \times 1.25$

$\Rightarrow \quad 5 \quad = \quad 5 \quad = \quad 5 \quad = \quad 5$ ✓

b.) x 70 when $y = 0.5 \Rightarrow 0.5 = \frac{5}{x^2} \Rightarrow x^2 = \frac{5}{0.5} \Rightarrow x^2 = 10 \Rightarrow \boxed{x = \sqrt{10}}$

$\approx \boxed{3.16}$

6.) a.) $R \propto V^2$

i.) $R = kV^2$, $(10, 0.5) \Rightarrow 0.5 = k(10)^2 \Rightarrow 0.5 = 100k \Rightarrow k = \frac{0.5}{100}$

$\Rightarrow k = \frac{1}{2} \cdot \frac{1}{100} = \frac{1}{200}$

$\therefore \boxed{R = \frac{V^2}{200}}$

ii.) $(20, 4) \rightarrow 4 = \frac{(20)^2}{200} \rightarrow 4 = \frac{400}{200} \rightarrow \boxed{4 \neq 2 \text{ not true}}$

b.) $R = kV^3 \rightarrow k = \frac{R}{V^3}$

$\Rightarrow \frac{0.5}{(10)^3} = \frac{0.4}{(20)^3} = \frac{13.5}{(30)^3} = \frac{32}{(40)^3} \Rightarrow \frac{0.5}{1,000} = \frac{4}{8,000} = \frac{13.5}{27,000} = \frac{32}{64,000}$

$\boxed{\Rightarrow \frac{1}{2000} = \frac{1}{2,000} = \frac{1}{2,000} = \frac{1}{2,000} \checkmark}$

c.) $\therefore R = \frac{V^3}{2,000}$ Find R when $V = 50$

$\rightarrow R = \frac{(50)^3}{2,000} = \frac{125,000}{2,000} = \frac{125}{2} = \boxed{62.5}$ units