

Please Show All Your Work.

1. [4 pts]
Simplify the following expression as much as possible.

$$\frac{(x^2-5)4x - (x^2+3)4x}{(x^2+3)^2} = \frac{\cancel{4x^3} - \cancel{20x} - \cancel{4x^3} - \cancel{12x}}{(x^2+3)^2} = \frac{-32x}{(x^2+3)^2}$$

2. [4 pts] If $f(x) = \frac{1}{x+2}$,

a) Find $f(5)$. $\frac{1}{7}$

b) Evaluate and simplify: $\frac{f(x)-f(5)}{x-5} = \frac{\frac{1}{x+2} - \frac{1}{7}}{x-5} = \frac{\frac{7-(x+2)}{7(x+2)}}{(x-5)}$

$$= \frac{7-x-2}{7(x+2)} \cdot \frac{1}{(x-5)} = \frac{5-x}{7(x+2)(x-5)} = \frac{-(x-5)}{7(x+2)(x-5)}$$

$$= \frac{-1}{7(x+2)}$$

3. [4 pts] Given $f(x) = x^2 + 2x + 1$

Find $\frac{f(x+h)-f(x)}{h}$

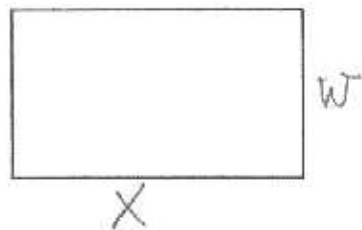
$$f(x+h) = (x+h)^2 + 2(x+h) + 1 = x^2 + 2xh + h^2 + 2x + 2h + 1$$

$$\frac{f(x+h)-f(x)}{h} = \frac{x^2 + 2xh + h^2 + 2x + 2h + 1 - x^2 - 2x - 1}{h} = \frac{h(2x+h+2)}{h}$$

$$= 2x + h + 2$$

4. [4 pts] A rectangle has an area 16 square meters. Express the perimeter of the rectangle as a function of the length of one of its sides x and simplify.

$$x \cdot w = 16 \implies w = \frac{16}{x}$$



$$P = 2x + 2w = 2x + 2\left(\frac{16}{x}\right)$$

$$= 2x + \frac{32}{x} \quad ; \quad \text{Domain } x > 0$$

5. [4 pts] The table lists the average carbon dioxide level in the atmosphere, measured in parts per million at Mauna Loa Observatory in 1980 and 2002. If we assume a **linear model**,

t	C , the CO_2 level (in ppm)
1980	338.7
2002	372.9

- a) Express C as a function of t ?

$$m = \frac{372.9 - 338.7}{2002 - 1980} = 1.5545$$

$$y - 338.7 = 1.5545(x - 1980)$$

$$y = 1.5545x - 2739.3$$

- b) What does the slope of your function represent in terms of the carbon dioxide in the atmosphere, and use appropriate units in your explanation.

slope is 1.5545, which means that every year the CO_2 level increases by 1.5545 ppm

- c) Use your model to predict the average carbon dioxide level in 2020, rounded to the nearest tenth ppm.

$$400.79 \text{ ppm} \approx 400.8 \text{ ppm}$$