

1. (2pts) Find the domain of the function  $f(x) = \frac{x+2}{x-4}$ .

$$x-4=0$$

$$x=4$$

Domain:  $x \neq 4$

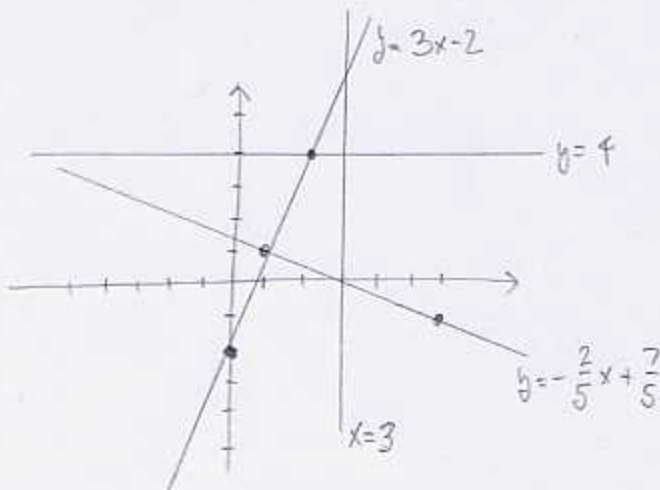
2. (5pts) Sketch the following four lines on the same graph:

a)  $y = 3x - 2$

b)  $2x + 5y = 7$

c)  $y = 4$

d)  $x = 3$



b)  $5y = -2x + 7$

$$y = -\frac{2}{5}x + \frac{7}{5}$$

x	y
1	1
6	-1

3. (7pts) A company that manufactures chairs finds that its daily cost is \$32,000 when it manufactures 500 chairs in a day, and its daily cost is \$68,000 if it manufactures 2,000 chairs in a day.

a) Assuming the cost function  $C(x)$  is linear, write an equation for the cost function.

b) What is the expected cost for producing 1,400 chairs?

c) Graph the cost function for  $0 \leq x \leq 3,000$ .

a) 

x	C
500	32,000
2000	68,000

Line passes through 2 points  
 $(500, 32,000)$  and  $(2000, 68,000)$

$$m = \frac{68000 - 32000}{2000 - 500} = \frac{36000}{1500} = \frac{360}{15} = 24$$

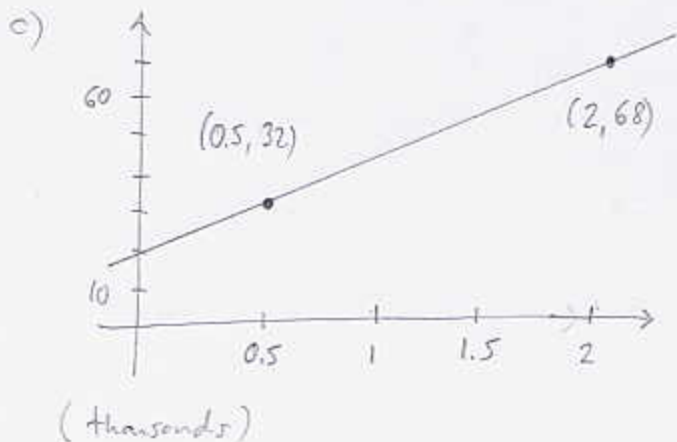
$$y - 32000 = 24(x - 500)$$

$$y = 24x - 12000 + 32000$$

$$C(x) = 24x + 20000$$

b) Expected cost is

$$C(1400) = 24 \cdot 1400 + 20000 = 53,600$$



4. (4pts) If  $f(x) = x^2 - 3x + 1$  find and simplify  $\frac{f(x+h) - f(x)}{h}$ .

$$\begin{aligned} \frac{f(x+h) - f(x)}{h} &= \frac{(x+h)^2 - 3(x+h) + 1 - (x^2 - 3x + 1)}{h} \\ &= \frac{\cancel{x^2} + 2xh + \cancel{h^2} - \cancel{3x} - 3h + \cancel{1} - \cancel{x^2} + \cancel{3x} - \cancel{1}}{h} \\ &= \frac{2xh - h - 3h}{h} = \frac{h(2x - 4)}{h} = 2x - 4 \end{aligned}$$

5. (12pts) **Example.** A company produces printers. Analysts at its financial department have found that the price-demand and cost functions are given by

$$p(x) = 500 - 1.5x$$

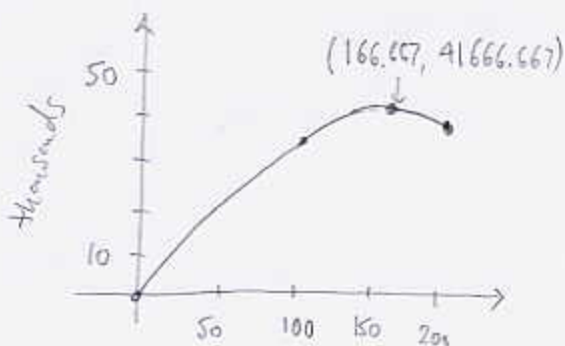
$$C(x) = 85 + 135x$$

$$0 \leq x \leq 200$$

where  $x$  is in thousands,  $p$  in dollars and  $C$  in thousands of dollars.

- Write the revenue function for this problem and graph it.
- Find **algebraically** the level of production that maximizes revenue and the maximal revenue.
- Write the profit function for this problem and graph it.
- Find **algebraically** the break-even points and check your answer using graphing features on your calculator.

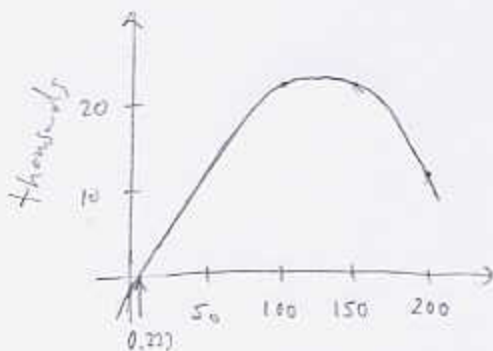
$$\begin{aligned} \text{a) } R(x) &= x p(x) \\ &= x(500 - 1.5x) \\ &= -1.5x^2 + 500x \end{aligned}$$



$$\text{b) } h = -\frac{500}{2(-1.5)} = \frac{500}{3} = 166.667$$

$$h = 41666.667 \leftarrow \text{maximal revenue}$$

$$\begin{aligned} \text{c) } P(x) &= R(x) - C(x) \\ &= -1.5x^2 + 500x - (85 + 135x) \\ &= -1.5x^2 + 365x - 85 \end{aligned}$$



agrees with  
zero feature  
of calculator

$$\text{d) } -1.5x^2 + 365x - 85 = 0$$

$$1.5x^2 - 365x + 85 = 0$$

$$x = \frac{365 \pm \sqrt{(365)^2 - 4(1.5)(85)}}{2(1.5)} = \frac{365 \pm \sqrt{132715}}{3} = \frac{243.1}{3}, \frac{0.233}{3}$$