

Show work where appropriate. Answers without adequate justification will not receive full credit.

1) (9pts) Given the following table

t	2	5	8	11
h	16	15	14	13

a) Find a formula for $h(t)$

$\Delta y / \Delta x = m = \frac{15-16}{5-2} = -\frac{1}{3}$
 $h = -\frac{1}{3}t + b$
 $16 = -\frac{1}{3}(2) + b$
 $16 = -\frac{2}{3} + b$
 $b = 16 + \frac{2}{3} = \frac{48}{3} + \frac{2}{3} = \frac{50}{3}$
 $h(t) = -\frac{1}{3}t + \frac{50}{3}$

b) Find the t intercept of this function

$0 = -\frac{1}{3}t + \frac{50}{3}$
 $t = -\frac{50}{-1} = 50$

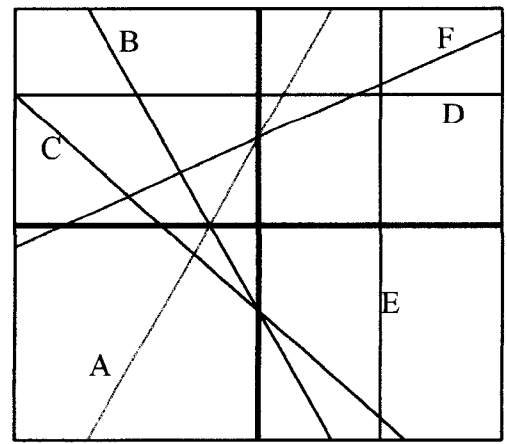
c) Find the h intercept of this function

$h(t) = -\frac{1}{3}t + \frac{50}{3}$
 $h(0) = -\frac{1}{3}(0) + \frac{50}{3} = \frac{50}{3}$

$(50, 0)$ t intercept
 $(0, \frac{50}{3})$ h intercept

2) (6pts) Match each graph with the corresponding line

- a) $x = 1.5$ E
- b) $y = 1.5$ D
- c) $y = -1 - 3x$ C
- d) $y = -1 - 2x$ B
- e) $y = x + 1$ A
- f) $y = 3x + 1$ F



3) (4pts) In 1996 we started our calculator rental program with 30 calculators and have been expanding it by about 15 calculators each year. In what year will we exceed 450 calculators?

$y = 15x + 30$
 $450 = 15x + 30$
 $\frac{450 - 30}{15} = (28 = x)$

Start
 1996 | 1997 | 1998
 30 | 45 | 60
 + 15 (number of years)
 $30 + 15x = \text{total cost}$

$1996 + 28 \text{ years} =$
 $= \text{total } 2024$

$y = \frac{1}{2}x + b$
 $-4 = \frac{1}{2}(-2) + b$

4) (14pts) A linear function $f(x)$ passes through the point $f(-4) = -2$ with a slope of $\frac{1}{2}$.

a) Graph the function $f(x)$. Be sure to label the axes.

b) Write the equation for $f(x)$

$-4 = \frac{1}{2}(-2) + b$

$f(x) = \frac{1}{2}x$

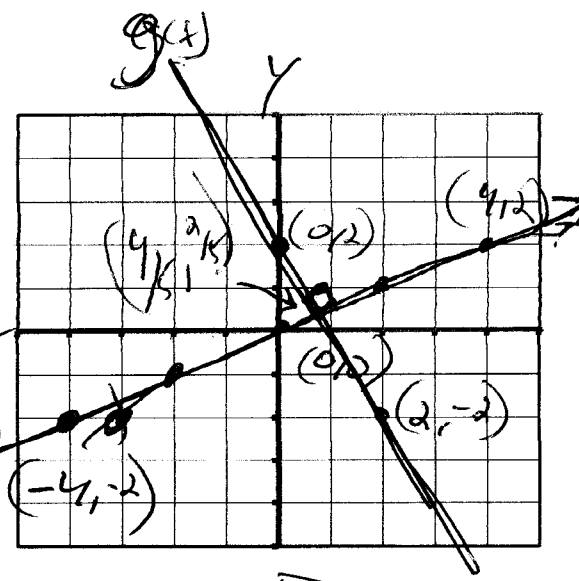
c) Write the equation of a line $g(x)$ that is perpendicular to $f(x)$ and passes through the point $(0, 2)$

$-4 = -4$
 $b = 2$

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

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

d) Graph $g(x)$



e) Find the coordinates of the intersection of the lines $f(x)$ and $g(x)$

$\frac{1}{2}x = -\frac{2}{1}x + 2$
 $\frac{1}{2}x + \frac{4}{2}x = 2$
 $\frac{5}{2}x = 2$
 $x = \frac{2}{5} \cdot \frac{2}{5} = \frac{4}{5} = x$

5) (4pts) Write the letter in the space provided that BEST describes the function over the entire domain.

- i) C The rate of change is 0 A) An increasing linear function
- ii) D The rate of change is undefined B) A decreasing linear function
- iii) B The rate of change is < 0 C) A Horizontal Line
- vi) A The rate of change is > 0 D) A Vertical Line

6) (8pts) A company's profit is linearly related to the number of items the company sells. Profit is a function of the number of items sold. If the company sells 2000 items, its profit is \$24,000. If the company sells 3000 items, its profit is \$30,000.

a) Find the slope & explain what it means in words.

P	i
24000	2000
30000	3000

$\frac{30000 - 24000}{3000 - 2000} = \frac{6000}{1000} = \frac{6}{1} = 6 = m$

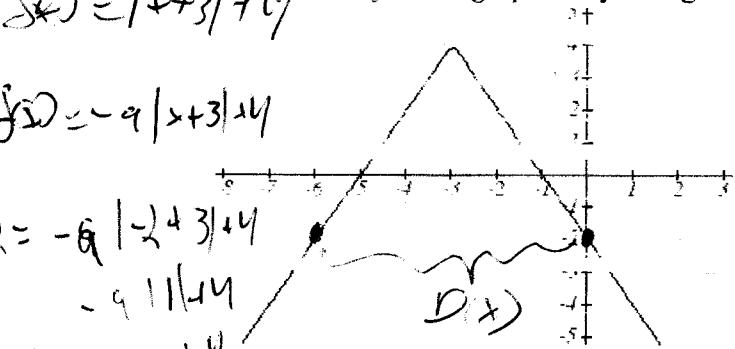
$P(i) = 6(i) + b$
 $24000 = 6(2000) + b$
 $24000 = 12000 + b$
 $12000 = b$

$P(i) = 6(i) + 12000$
 each item has a profit of 6
 times each ~~item~~ number of items sold

b) $f(4380) = \$280$ profit for 4380 units sold.

(9pts) Shown below is a graph of $f(x)$. Solve $f(x) \geq -2$

may solve graphically or algebraically)



$$f(x) = -2|x+3|+4$$

$$-2 \leq -2|x+3|+4$$

$$-6 \leq -2|x+3|$$

$$3 \leq |x+3|$$

$$x \geq 0, x \leq -6$$

8) (9pts) Given the function $f(x) = 3|x+2| - 4$

a. Algebraically find the coordinates of the vertical intercept

$(0, 2)$

~~$0 = 3|x+2| - 4$~~

$f(x) = y = 3|0+2| - 4$

$3(2) - 4$

$6 - 4 = 2 = y$

b. Algebraically find the coordinates of the horizontal intercept(s)

~~$f(x) = 3|x+2| - 4$~~ ~~$0 = 3|x+2| - 4$~~

~~$4 = 3|x+2|$~~ ~~$\frac{4}{3} = |x+2|$~~ ~~$x = \frac{4}{3} - 2$~~ ~~$x = -\frac{2}{3}$~~

~~$x = -\frac{4}{3} - 2$~~ ~~$x = -\frac{10}{3}$~~

c. When will this function be greater than 0?

$(-\frac{10}{3}, 0), (-\frac{2}{3}, 0)$

$\{x | x < -\frac{10}{3}, x > -\frac{2}{3}\}, f(x) > 0$

9) (3pts) Data set A has correlation of 0.8 and data set B has correlation of -0.9. Which set of data is more accurately modeled with a linear function? Why?

The closer the coefficient to 1, or -1 (increasing, decreasing) the better model of the function, so -0.9 is a closer (better) fit than 0.8