Practice for Chapter 2
Math 1

Name: KEY

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

1) Given the following table

t	2	5	8	11
h	10	8	6	4

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

$h(t) = \frac{-2}{3}t + \frac{34}{3}$

* double check that $h(8) = 6$, $h(11) = 4$.

b) Find the t intercept of this function

$(17, 0)$

c) Find the h intercept of this function

$(0, \frac{34}{3})$

2) Match each graph with the corresponding line

horizontal a) $y = 1.5$ D

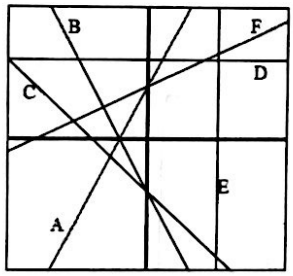
vertical b) $x = 1.5$ E

positive slopes c) $y = x + 1$ F

d) $y = 3x + 1$ A

negative slopes e) $y = -1 - 3x$ B

f) $y = -1 - 2x$ C



(d) should have "bigger" slope (i.e. increasing faster) than (c)

(e) is decreasing faster than (f)

(1) (a) Use (2,10) and (5,8) to find the slope:

$m = \frac{8-10}{5-2} = \frac{-2}{3}$

Use point-slope formula with $m = \frac{-2}{3}$ and $(x_1, y_1) = (2, 10)$:

$y - 10 = \frac{-2}{3}(x - 2)$

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

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

$y = \frac{-2}{3}x + \frac{34}{3}$

$h(x) = \frac{-2}{3}x + \frac{34}{3}$

(b) t-int occurs when $h(t) = 0$

$\frac{-2}{3}t + \frac{34}{3} = 0$

$\frac{3}{2} \cdot \frac{2}{3}t = \frac{34}{3} \cdot \frac{3}{2}$

$t = \frac{34}{2}$

$t = 17$ $(17, 0)$

(c) h-int occurs when $t = 0$

$h(0) = \frac{-2}{3}(0) + \frac{34}{3} = \frac{34}{3}$

3) A linear function $f(x)$ passes through the point $f(-4) = -3$ with a slope of ½.

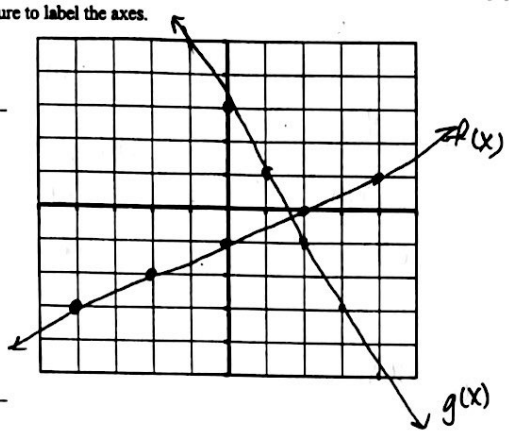
a) **Graph** the function $f(x)$. Be sure to label the axes.

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

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

c) Write the equation of a line $g(x)$ that is PERPENDICULAR to $f(x)$ and passes through the point (0, 3)

$g(x) =$ $-2x+3$



d) Graph $g(x)$

e) Find the coordinates of the intersection of the lines $f(x)$ and $g(x)$ $\left(\frac{8}{5}, \frac{-1}{5}\right)$

$f(-4) = -3$ means the graph passes through the point $(-4, -3)$

(3)(b) Two ways:

(i) from graph, the y-int is -1

given $m = \frac{1}{2}$

use $y = mx + b$

(ii) use point-slope w/ point $(-4, -3)$, $m = \frac{1}{2}$.

(3)(c) slope of $g = \frac{-1}{\frac{1}{2}} = -1 \cdot \frac{2}{1} = -2$

y-int is 3 (since $(0, 3)$)

Therefore $g(x) = -2x + 3$

(3)(d) Set $f(x) = g(x)$

$\frac{1}{2}x - 1 = -2x + 3$

$\frac{5}{2}x = 4$

$x = 4 \cdot \frac{2}{5}$

$x = \frac{8}{5}$

Find y-value by plugging in to either $f(x)$ or $g(x)$

$f\left(\frac{8}{5}\right) = \frac{1}{2} \cdot \frac{8}{5} - 1 = \frac{4}{5} - 1 = \frac{-1}{5}$

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4) (6pts) In 1997 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 400 calculators?

One way: (1997, 30 calculators)

$m =$ 15 calculators per year

use point-slope: $y - 30 = 15(x - 1997)$

$y = 15x - 15(1997) + 30$

$y = 15x - 29{,}925$

Now set $15x - 29{,}925 > 400$

$15x > 30{,}325$

$x > 2021.666\ldots$ → in the year 2021

Another way (easier): Treat 1997 as the "0th" year, i.e. $x = 0$

$(0, 30)$

Slope $m = 15$

use slope-intercept: $y = 15x + 30$

Now set $15x + 30 > 400$

$15x > 370$

$x > 24.666\ldots$

In 24+ years we will exceed 400 calculators

$\Rightarrow$ $1997 + 24 = 2021$

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

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

6) 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 \$32,000.

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

b) Find the vertical (profit) intercept & explain what it means in words

c) Find $f(4380)$ and explain what it means in words

⑥(a) (2000 items, \$24,000)
(3000 items, \$32,000)

$$m = \frac{\$32{,}000 - \$24{,}000}{3000 - 2000 \text{ items}} = \frac{\$8000}{1000 \text{ items}}$$

$m = \$8 / \text{item}$
i.e. for every item sold, the company increases its profit by \$8

⑥(b) use point-slope w/ (2000, 24,000) and $m = 8$

$y - 24{,}000 = 8(x - 2000)$
$y = 8x - 16000 + 24000$
$y = 8x + 8000$

vertical-int (a.k.a. y-int) occurs when $x = 0$:
$y = 8(0) + 8000 = 8000 \Rightarrow$ y-int = 8000
i.e. for 0 items sold, the company had a profit of \$8000

⑥(c) $f(x) = 8x + 8000$
$f(4380) = 8(4380) + 8000$
$= 43040$
when for 4380 items sold, the company will have a profit of \$43040

7. Given the function $f(x)=3|x-2|-4$

b. Algebraically find the coordinates of the vertical intercept

(0, 2)

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

$(10/3, 0), (2/3, 0)$

d. When will this function be greater than 0?

$x > 10/3$ or $x < 2/3$

⑦(b) vertical-int (a.k.a. y-int)

occurs when $x=0$

$f(0) = 3|0-2| - 4$

$= 3(2) - 4 = 6-4 = 2$

⑦(c) horizontal-int (a.k.a. x-int)

occurs when $y=0$ (isolate abs value)

$0 = 3|x-2|-4 \Rightarrow 4 = 3|x-2| \Rightarrow 4/3 = |x-2|$

$x-2 = \frac{4}{3}$ $\qquad$ $x-2 = -\frac{4}{3}$

$x = \frac{10}{3}$ $\qquad$ $x = \frac{2}{3}$

⑦(d) $3|x-2|-4 > 0$ isolate abs. value

$3|x-2| > 4 \Rightarrow |x-2| > 4/3$

$x-2 > 4/3$ or $x-2 < -\frac{4}{3}$

$x > 10/3$ or $x < \frac{2}{3}$

8. Solve each inequality and write your answers using interval notation.

1. $|3x+1| < 10$ $\quad -11 < x < 3$

2. $|2x-6| \geq 12$ $\quad x \geq 9$ or $x \leq -3$

⑧ 1. $|3x+1| < 10$

$-10 < 3x+1 < 10$

$-11 < 3x < 9$

$\frac{-11}{3} < x < 3$

2. $|2x-6| \geq 12$

$2x-6 \geq 12$ or $2x-6 \leq -12$

$2x \geq 18$ $\qquad$ $2x \leq -6$

$x \geq 9$ or $x \leq -3$