

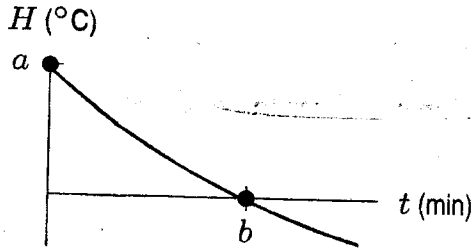
27 points

Honors 125
Homework #1

Name ANSWER KEY
Due Wednesday, September 16, 2009

1. An object is put outside on a cold day at time $t = 0$. Its temperature, $H = f(t)$, in $^{\circ}\text{C}$, is graphed below.

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- a) What does the statement $f(30) = 10$ mean in terms of temperature of the object? Include units for 30 and 10 in your answer.

After 30 minutes outside, the temperature of the object is 10°C .

- b) Explain what the vertical intercept, a , represents in terms of temperature of the object and time outside.

The temperature of the object at the instant it is placed outside is $a^{\circ}\text{C}$.

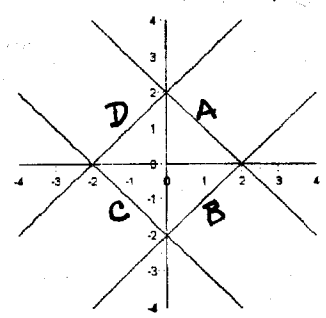
- c) Explain what the horizontal intercept, b , represents in terms of temperature of the object and time outside.

The temperature of the object is 0°C after it has been outside for b minutes.

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2. The figure below shows four lines given by the equation $y = mx + b$. Match the lines to the conditions on the parameters m and b .

- a) $m > 0, b > 0$ D
- b) $m > 0, b < 0$ B
- c) $m < 0, b < 0$ C
- d) $m < 0, b > 0$ A



3. A city's population was 35,700 in the year 2000 and since then has grown by 950 people per year.

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- a) Write a linear function that describes the city's population P as a function of the number of years, t , since 2000.

$P(t) = 35,700 + 950t$

Problem 3 is continued on the next page.

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b) Give units for and interpret the slope and vertical intercept of the function you found in part a. The slope represents an increase of 950 people per year. The vertical intercept is the population in 2000 ($t=0$).

c) If the population continues to grow at the same rate, what is the population predicted to be in 2015? $P(15) = 35,700 + 950(15) = 49,950$ people

d) If the population continues to grow at the same rate, in what year is the population expected to reach 48,000?

$$48,000 = 35,700 + 950t$$

$$\begin{array}{r} 48,000 \\ - 35,700 \\ \hline 12,300 \end{array} = 950t \quad t = \frac{12,300}{950} \approx 12.9$$

So at the end of 2012 the population should be 48,000

4. A company can produce 1000 puzzles per month at a total cost of \$6000 and it can produce 1500 puzzles per month at a total cost of \$7500. It can sell the puzzles for \$5 each.

a) Express the monthly cost of manufacturing puzzles, C , as a linear function of x , the number of puzzles produced. $m = \frac{7500 - 6000}{1500 - 1000} = \frac{1500}{500} = \3.00 per puzzle.

$$y - 6000 = 3(x - 1000) = 3x - 3000; \quad C(x) = 3x + 3000.$$

b) What are the company's monthly fixed costs and what is the marginal cost per puzzle? The fixed costs are \$3000/month and the marginal cost is \$3.00/puzzle.

c) Write the revenue and profit functions for this company's monthly production of puzzles.

$$\text{Revenue} = 5x = R(x) \quad \text{Profit} = \text{Revenue} - \text{Cost} = 5x - (3x + 3000) = \text{Profit}$$

$$5x - 3x - 3000 = 2x - 3000.$$

d) How many puzzles must the company sell per month to break even?

Let profit = 0 = $2x - 3000$; $3000 = 2x$; $x = 1500$ puzzles to break even.

5. Find a linear equation whose graph is the line with the properties that it is through the point (5, -1) and decreasing at a rate of 2 units of y per 1 unit of x .

$$m = -\frac{2}{1} \quad y - (-1) = -2(x - 5) = -2x + 10$$

$$y + 1 = -2x + 10$$

$$y = -2x + 9$$

6. Problem 12 on page 64.

Attached

7. Problem 34 on page 80.

Costs: \$3885/hour

Revenue: \$100 x

$$\text{Profit} = \text{Revenue} - \text{Cost}$$

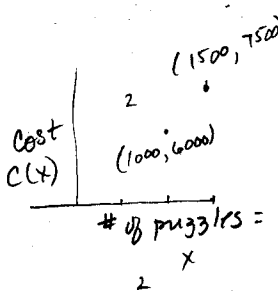
$$= 100x - 3885 \quad \text{Domain} \quad (0 \leq x \leq 295)$$

Let profit = 0 = $100x - 3885$

$$100x = 3885$$

$$x = 38.85, \text{ so to earn a profit}$$

the plane must carry at least 39 passengers.



#6 —
problem 12, page 64

x	-10	0	10	20	30
f(x)	-1.5	0	1.5	2.5	3.5
g(x)	-9	-4	1	6	11

Note: change in x each time is +5

$$\text{check } f(x): \frac{0 - (-1.5)}{10} = \frac{1.5}{10}, \frac{1.5 - 0}{10} = \frac{1.5}{10}, \frac{2.5 - 1.5}{10} = \frac{1}{10}$$

slopes

Not equal, $\therefore f(x)$ is not linear.

$$\text{check slopes } g(x): \frac{-4 - (-9)}{10} = \frac{5}{10} = \frac{1}{2}, \frac{1 - (-4)}{10} = \frac{5}{10} = \frac{1}{2}, \frac{6 - 1}{10} = \frac{5}{10} = \frac{1}{2}, \frac{11 - 6}{10} = \frac{5}{10} = \frac{1}{2}$$

Equation: $g(x) = \left(\frac{1}{2}\right)x + (-4)$ or $g(x) = \frac{1}{2}x - 4$