MAC1105 Test 1 Name Key
(D. Howard 3-16)

1. The percentage of farmers using draft horses in their field in a particular country has been estimated to be $p = 84.308 - 0.6722x$, where x is the number of years since 1910.

a.) Is this model a function? Why or why not?

(5) Yes, for every x, there is only one p or it passes the vertical line test.

b.) Complete the table. Round to 2 decimal places.

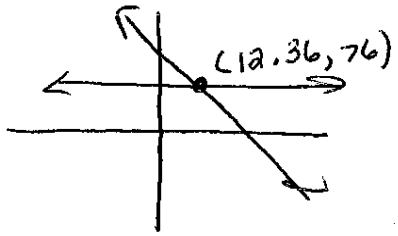
(5)

x	p
0	84.31
25	67.50
40	57.42

c.) During what year did the model predict that the percentage of farmers using draft horses will be 76%? Solve **graphically** and show appropriate work.

(5) $Y1 = 84.308 - 0.6722x$

$Y2 = 76$



12th year after 1910

1922

d.) In 1950, the percentage of farmers using draft horses was actually less than 5%. Did the model accurately describe the percentage of farmers using draft horses for 1950?

(5) $X = 40 \Rightarrow 1950$

$Y = 84.308 - 0.6722(40) = 57.42$

No, it predicts it to be 57%.

e.) What is the average rate of change of the model?

(5) $m = -0.6722$

f.) Interpret the meaning of the average rate of change in the context of the problem.

(5) $m = \frac{-0.6722\%}{1 \text{ year}}$ The percentage of farmers using draft horses is decreasing by 0.6722% each year.

g.) State the meaning of the y-intercept in the context of the problem.

(5) (0, 84.308)

↓ since 1910 ↓ percentage

The percentage in 1910 of farmers using draft horses was 84.308%.

2. The table gives the number of drinks and the blood alcohol percent for a man of a certain weight legally considered driving under the influence (DUI).

# of drinks	5	6	7	8	9	10
Blood Alcohol %	0.22	0.25	0.31	0.34	0.38	0.42

.03 .06 .03 .04 .04

a.) Can this data be represented exactly by a line? Why or why not?

(5) No, not constant slope. Some slope $\frac{0.03}{1}$, $\frac{0.06}{1}$, $\frac{0.04}{1}$

b.) Use linear regression to find the best fit equation of a line. State the equation of the line rounding each coefficient to 2 decimal places.

(5) $y = 0.04x + 0.02$

c.) Use your model to predict the person's blood alcohol level for 11 drinks **algebraically** and show appropriate work.

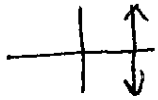
(5) $y = 0.04(11) + 0.02 = 0.46$

3. a.) Sketch a graph of a line with positive slope and negative y-intercept.

(5)

b.) Sketch a graph of a line with undefined slope.

(5)



c.) Which line would be steeper: a line with slope 1/3 or a line with slope -3?

(5)

d.) What is the slope of a line that is perpendicular to $2x + 3y = 4$?

(5) $\perp m = +3/2$

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

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

$m = -2/3$

4. Suppose the original value of an automobile is \$20,000 and it is worth \$6,000 after 10 years. (0, 20000) (10, 6000)

a.) Write a linear equation that models the value, V, of the automobile and the end of year t. $m = \frac{6000 - 20000}{10 - 0} = \frac{-14000}{10} = -1400$ $b = 20{,}000$

(5) $y = -1400x + 20{,}000$ $V = -1400t + 20{,}000$

b.) When will the automobile be worth less than half its original value?

(5) $-1400x + 20{,}000 < 10{,}000$

$-20{,}000 \quad -20{,}000$

$\frac{-1400x}{-1400} < \frac{-10{,}000}{-1400}$

$x > 7.14$ years

5. A promoter needs to generate \$76,800 on 1800 tickets. She sells the tickets for the closer seats for \$54 each and the tickets for seats farther away for \$37 each.

a.) Set up a system of equations that models this scenario.

(5)

$$\begin{cases} x + y = 1800 \\ 54x + 37y = 76{,}800 \end{cases}$$

b.) Solve the system of equations by using the method of your choice. Show appropriate work.

(-37)

$$\begin{cases} x+y=1800 \\ 54x+37y=76800 \end{cases}$$

$$-37x - 37y = -66600$$
$$+54x + 37y = 76800$$
$$\frac{17x}{17} = \frac{10200}{17}$$

$x = 600$

$y = 1800 - 600 = 1200$

(5)

$$\begin{cases} x+y=1800 \Rightarrow y = 1800-x \\ 54x+37y=76{,}800 \end{cases}$$

$$54x + 37(1800-x) = 76800$$
$$54x + 66600 - 37x = 76800$$
$$17x + 66600 = 76800$$
$$\frac{17x}{17} = \frac{10200}{17}$$

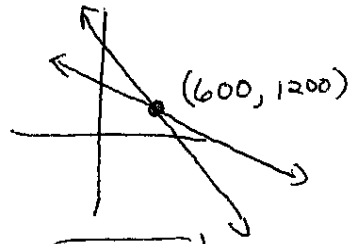
$x = 600$

$y = 1800 - 600 = 1200$

$$\begin{cases} x+y=1800 \\ 54x+37y=76{,}800 \end{cases}$$

$y_1 = 1800 - x$

$y_2 = (-54x + 76800)/37$



$x = 600$

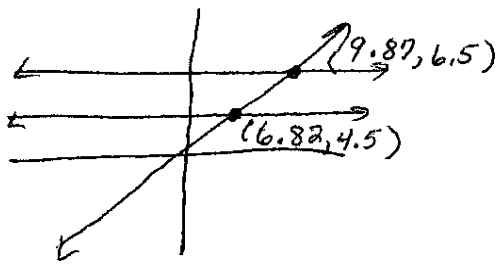
$y = 1200$

6. The percent, p, of high school seniors who use marijuana daily is given by $p = \frac{19x+1}{29}$, where x is the number of years after 1990. For what years (rounded to 2 decimal places) does the model predict that the percent will be between 4.5 percent and 6.5 percent?

a.) Solve **graphically** and show appropriate work.

(5)

$$4.5 < \frac{(19x+1)}{29} < 6.5$$



$6.82 < x < 9.87$ after 1990

$1996.82 < x < 1999.87$

b.) Solve **algebraically** and show appropriate work.

(5)

$$(29)(4.5) < \frac{29(19x+1)}{29} < (6.5)(29)$$

$$130.5 < 19x + 1 < 188.5$$
$$-1 \quad -1 \quad -1$$
$$\frac{129.5}{19} < \frac{19x}{19} < \frac{187.5}{19}$$

$6.82 < x < 9.87$ after 1990

$1996.82 < x < 1999.87$