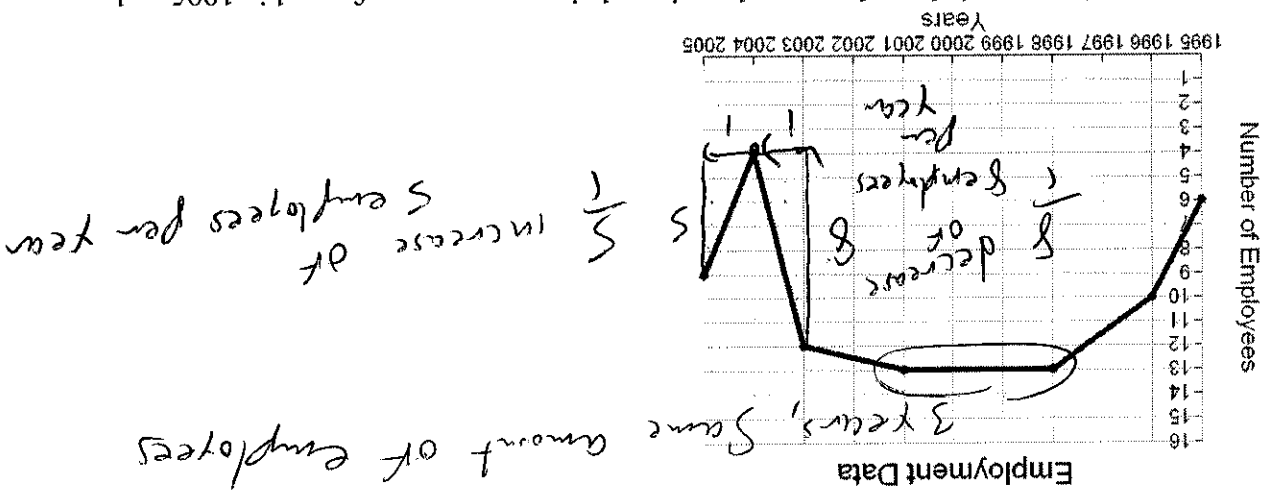


Due Date: Thursday, January 19, 2006

Mark out of 80
Page 1 of 12

Part A: Multiple Choice 10 marks

Place correct answers on the sheet provided at the end of the multiple choice questions.



Snowbusters has recorded employment data since their company was formed in 1995 and placed it in the above graph. Please use the above graph to answer questions 1 to 4.

1) How many employees were there when the company first started??

- a) 0
- b) 5
- c) 6
- d) 10

2) What was the greatest rate of hiring for Snowbusters?

- a) $\frac{0}{\text{employees year}}$
- b) $\frac{4}{\text{employees year}}$
- c) $\frac{5}{\text{employees year}}$
- d) $\frac{8}{\text{employees year}}$

Due Date: Thursday, January 19, 2006

Mark out of 80
Page 2 of 12

3) What was the greatest rate of layoffs for Snowbusters?

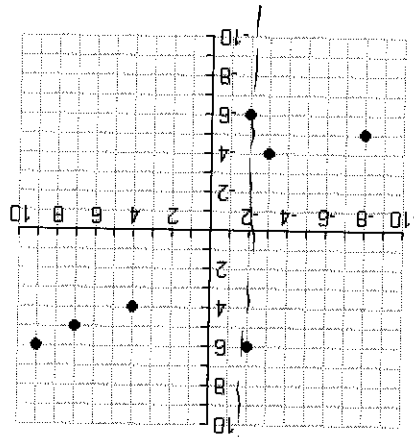
- a) $\frac{0 \text{ employees}}{\text{year}}$
- b) $\frac{4 \text{ employees}}{\text{year}}$
- c) $\frac{5 \text{ employees}}{\text{year}}$
- d) $\frac{8 \text{ employees}}{\text{year}}$

4) How many years did Snowbusters not hire or layoff employees?

- a) 0
- b) 2
- c) 3
- d) 10

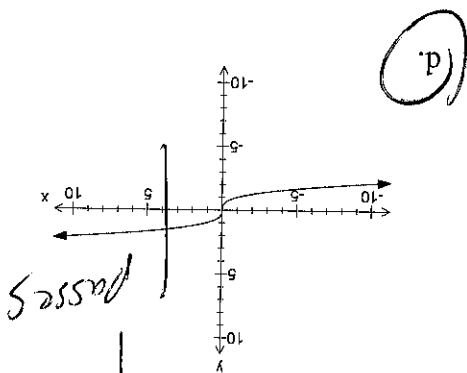
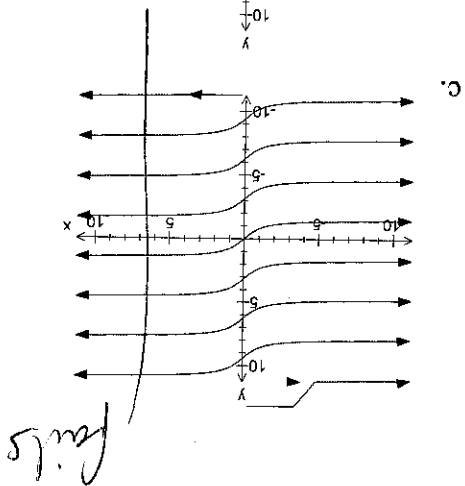
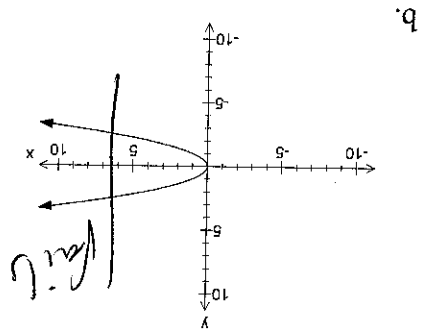
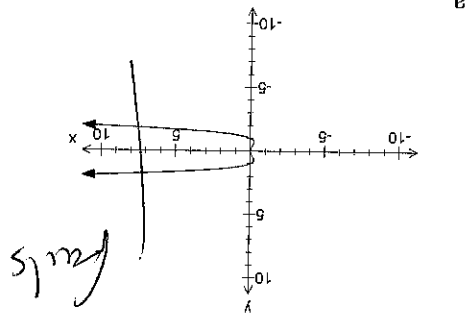
5) Which answer below is true for the graph below?

- a) It represents a function because it passes the vertical line test.
- b) It does not represent a function because it passes the vertical line test.
- c) It represents a function because it fails the vertical line test.
- d) It does not represent a function because it fails the vertical line test.



fails function

6) Which graph below represents a function?

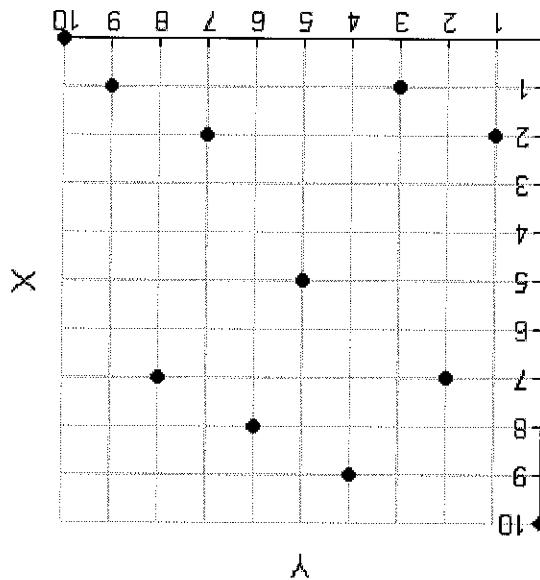


7) An equation that shows the relationship between the volume of a cube (box) and the length of a side is given by $V(s) = s^3$ where V is the volume and s is the length. Which answer below is true?

- a) s is the dependent variable
- b) V is the independent variable
- c) s is the independent variable
- d) there are no independent or dependent variables in this situation.

Due Date: Thursday, January 19, 2006

Mark out of 80
Page 4 of 12



8) If a linear regression analysis were conducted on the above data, which answer below would best match the results?

- a) The correlation coefficient is very close to 1 and a strong positive correlation with the data.
- b) The correlation coefficient is very close to -1 and a strong negative correlation with the data.
- c) The correlation coefficient is very close to 0 and a weak negative correlation with the data.
- d) The correlation coefficient is very close to 0 and a strong negative correlation with the data.

4	C
3	P
2	C
1	C
8	C
7	C
6	P
5	P

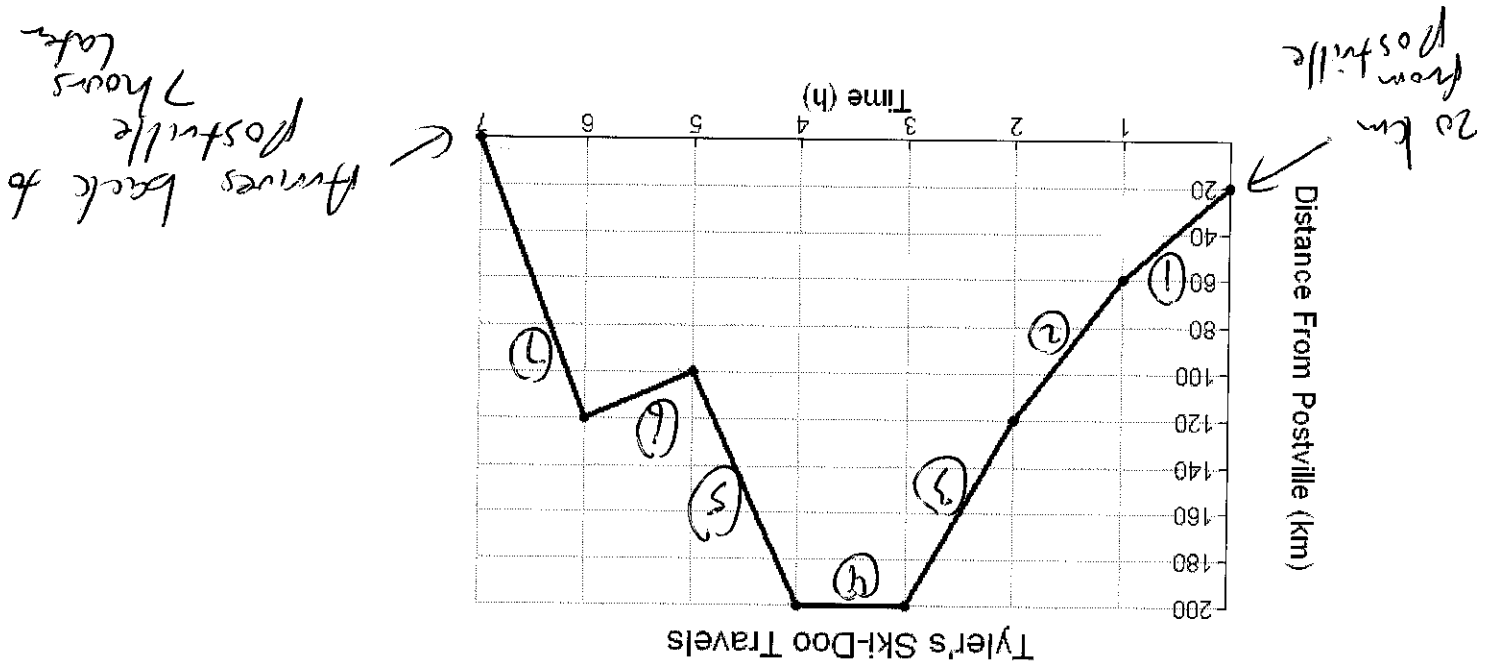
Due Date: Thursday, January 19, 2006

Mark out of 80
Page 5 of 12

Part B Long Answer

Place all your workings on the space provided.

1) Tyler has decided to log his Ski-doo travels. His information is included on the graph below.



Write a paragraph describing his trip. Include in your discussion any relevant information like speeds, times and initial/final positions. (8 marks)

- ① 40 km/h → away from Postville
- ② 60 km/h → away from Postville
- ③ 80 km/h → away from Postville
- ④ Stopped for 1 hour
- ⑤ 100 km/h → towards Postville
- ⑥ 20 km/h → away from Postville
- ⑦ 120 km/h → towards Postville

Due Date: Thursday, January 19, 2006

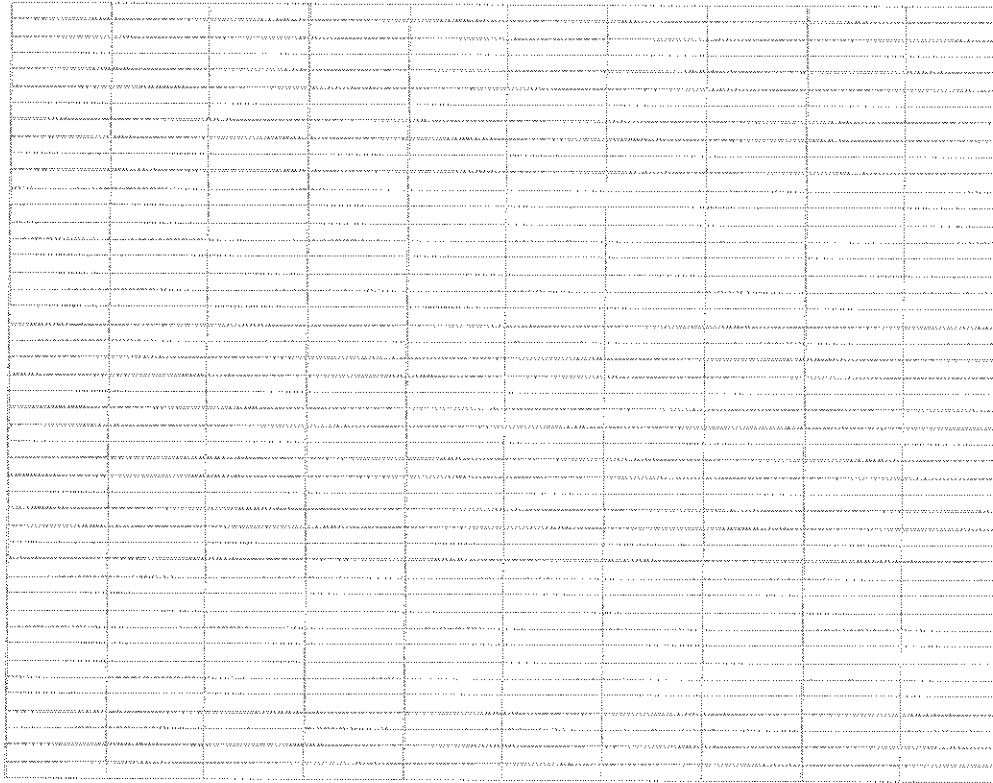
Mark out of 80
Page 6 of 12

2) The speed of sound changes as the altitude (height above sea level) changes. Below is a table which contains the speed of sound at various altitudes. Assume h represents the altitude in thousands of feet and V represents the speed of sound in feet per second.

Altitude (h)	Speed of Sound (V)
0	1116
5	1097
10	1077
15	1057
25	1015
30	995
35	973

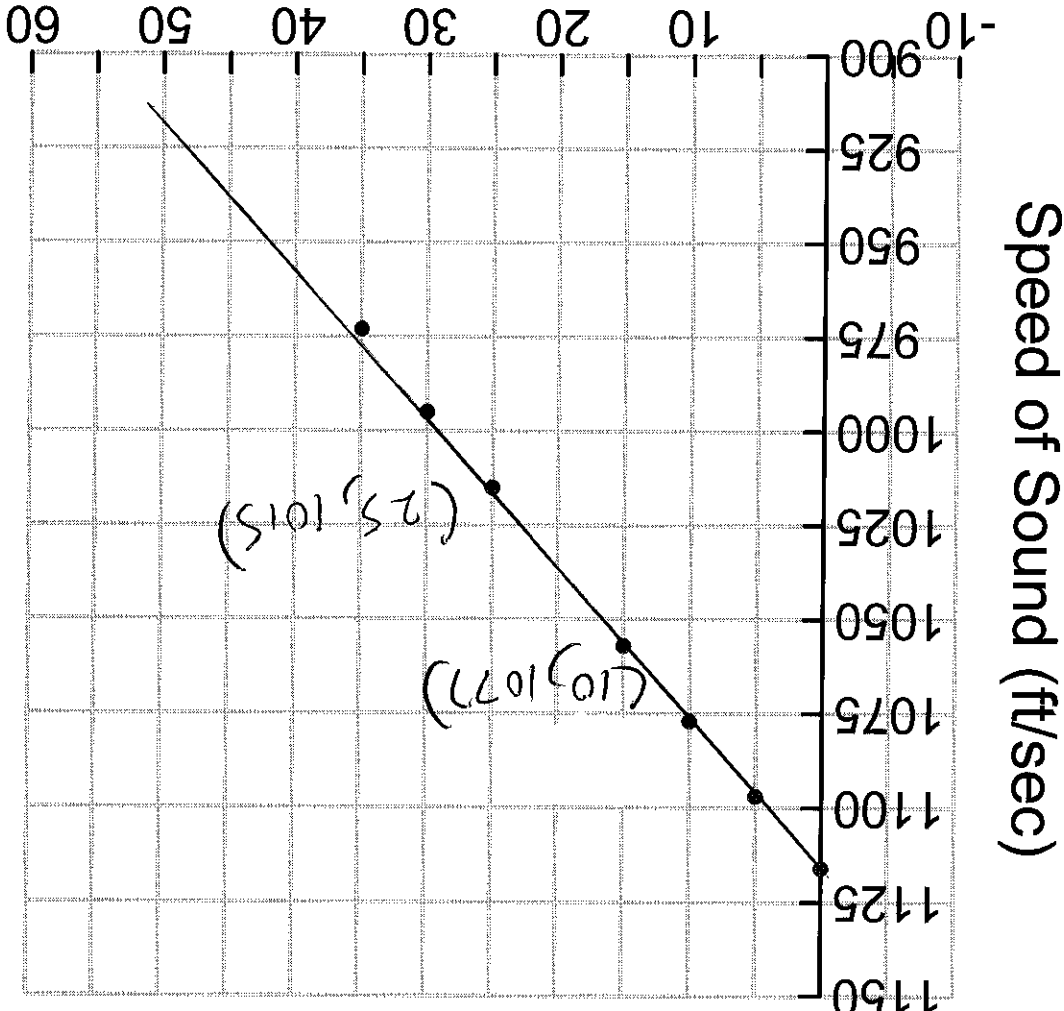
a) Create a Scatter Plot of the data on the grid below. (4 marks)

b) Draw a line of best fit and algebraically determine its equation. (6 marks)



#29

Speed of Sound Vs Altitude



Equation: $y = \text{Speed of Sound}$
 $x = \text{Altitude}$

$$y = -4.13x + 1118.3$$

$$1077 = -4.13(10) + b$$

$$1077 = -41.3 + b$$

$$1077 + 41.3 = -41.3 + b + 41.3$$

$$1118.3 = b$$

Slope = $\frac{1015 - 1077}{25 - 10}$

$$= \frac{-62}{15}$$

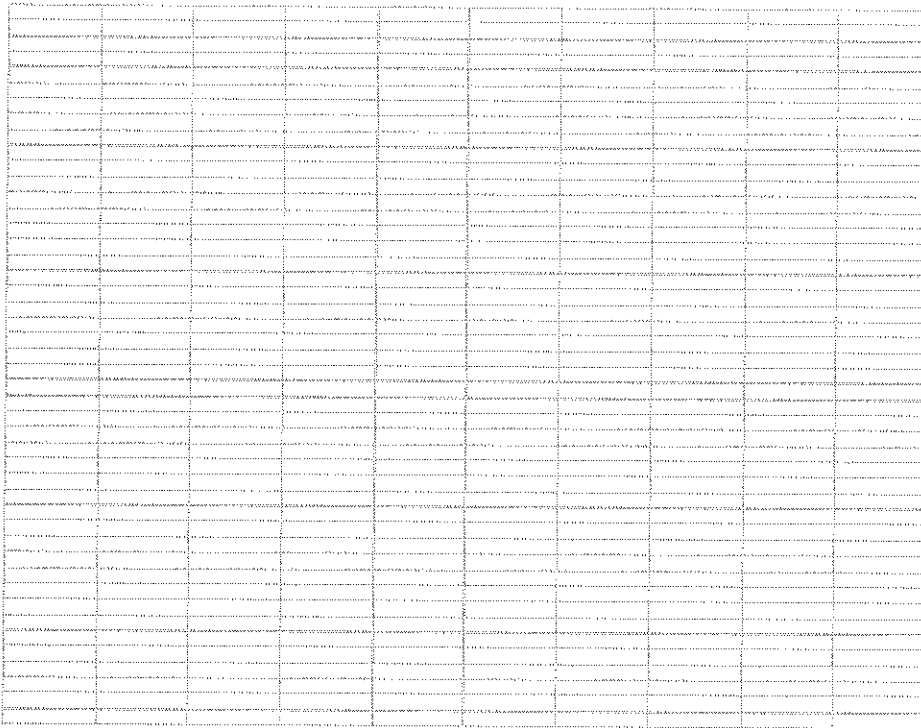
$$= -4.13$$

y = mx + b

Due Date: Thursday, January 19, 2006

Mark out of 80
Page 7 of 12

c) Reproduce the scatter plot from part a. Construct the median-median line for the data and show all workings. (8 marks)



Summary Point 1 (S, 1097)

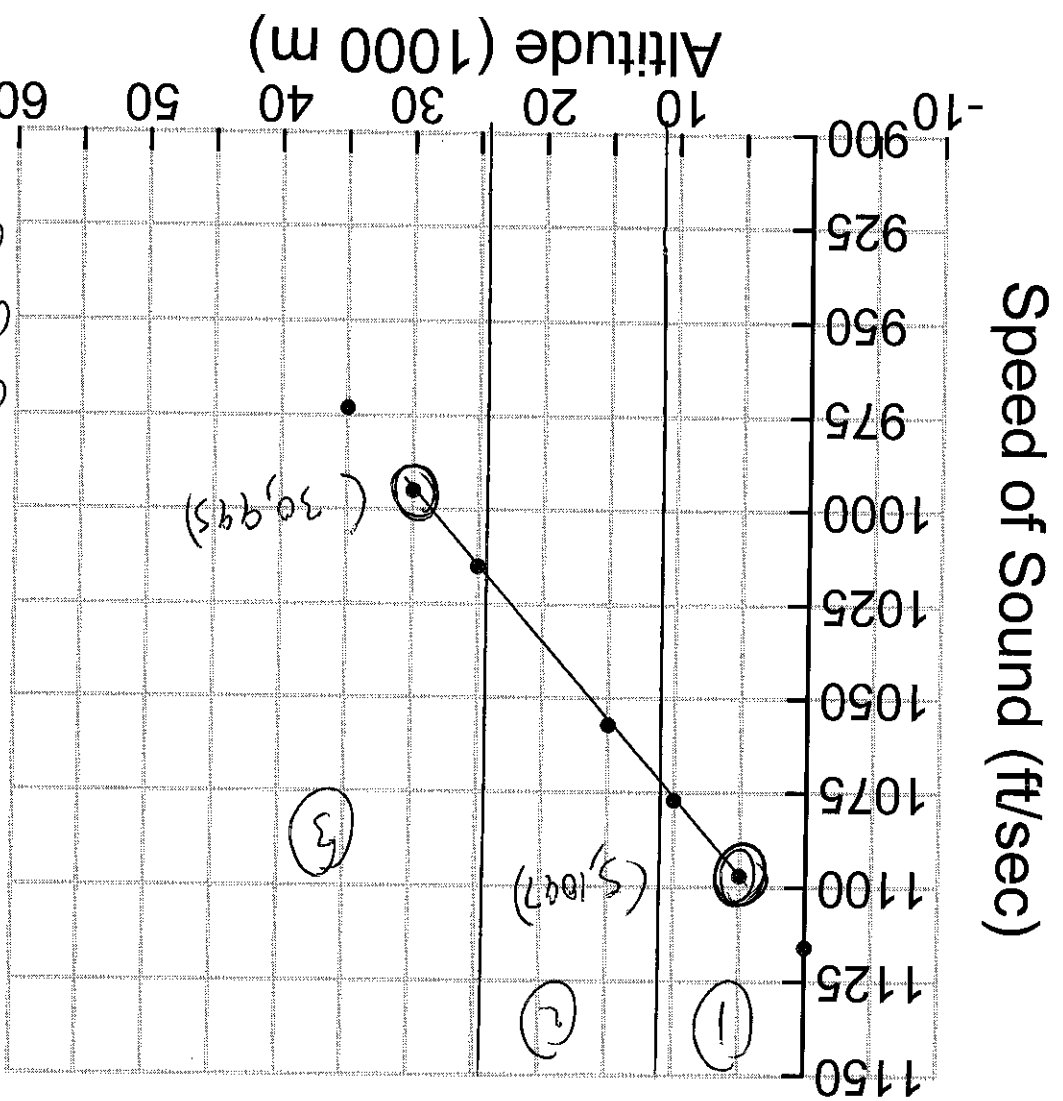
Median
 0 5 10
 1116 (1097)
 1077

Summary Point 2 (15, 1057)

Summary Point 3 (30, 995)

Median
 25 30 35
 1015 995
 973

Median - Median line



Speed of Sound Vs Altitude

$y = mx + b$
 $995 = -4.08(30) + b$
 $995 + 122.4 = -12.24 + b$
 $1117.4 = -12.24 + b$
 $1129.64 = b$
 $y = -4.08x + 1129.64$
 Slope: $\frac{995 - 1100}{30 - 5} = \frac{-105}{25} = -4.08$

$y = -4.08x + 1129.64$

d) Using the equation for the line of best fit you obtained in part (b), find the speed of sound at 20,000 feet. What is this type of prediction called? (2 marks)

$$y = -4.13x + 1118.3$$

$$y = -4.13(20) + 1118.3$$

$$y = 1032.1$$

The speed of sound at 20,000 ft will be 1032.1 ft/sec.

This type of prediction is called interpolation.

e) Using the equation for the line of best fit you obtained in part (b), find the altitude at which the speed of sound will be 900 ft/sec. What is this type of prediction called? (2 marks)

$$900 = -4.13x + 1118.3$$

$$900 - 1118.3 = -4.13x + 1118.3 - 1118.3$$

$$\frac{-218.3}{-4.13} = \frac{-4.13x}{-4.13}$$

$$52.9 = x$$

The altitude will be 52.9 or 53,000 ft. This type of prediction is called extrapolation.

f) Find the equation for the line of best fit using the graphing calculator. Be sure to include all information that is obtained when you use the graphing calculator. (4 marks)

$$y = -4.09x + 1117.3$$

$$r^2 = 0.9997$$

$$r = -0.9999$$

Due Date: Thursday, January 19, 2006

Mark out of 80
Page 9 of 12

3) Below are two tables of data. For each table use linear, quadratic and exponential regression analysis to determine the best line or curve of best fit. Be sure to write 3 equations for each table and explain, using correlation coefficients, why the equation that you choose is the best. (18 marks)

Table 1

x	y
1	12
2	9
3	9
4	6
5	4
6	3

Linear Regression
 $r = -0.9817$

$r^2 = 0.9637$

Quadratic Regression
 $R^2 = 0.9645$

Exponential Regression
 $r^2 = 0.9557$

Equation $y = -1.8x + 13.5$

Equation $y = 0.0357x^2 - 2.05x + 13.8$

Equation $y = 17.05(0.76)^x$

The linear regression is best $r = -0.9817$ which is close to -1 and a strong negative correlation.

x	y
1	4
2	12
3	28
4	50
5	76
6	111

Table 2

Equation $y = 21.4x + -28.07$

Equation $y = 3.125x^2 + -0.475x + 1.1$

Equation $y = 2.96(1.91)^x$

Linear Regression
 $r = 0.9779$

$r^2 = 0.9563$

Quadratic Regression
 $R^2 = 0.9998$

Exponential Regression
 $r^2 = 0.9551$

Quadratic regression is best
 \checkmark term closest to 1

Due Date: Thursday, January 19, 2006

Mark out of 80
Page 11 of 12

4) A cup of coffee was placed inside a refrigerator whose temperature was slightly above 0 °C. The temperature of the coffee was recorded over time and placed in the table below. Let T represent temperature in °C and m represent time in minutes.

Temperature	100	54	35	21	12	7	4
Time (min)	0	5	10	15	20	25	30

a) What is the independent variable? Dependent variable? (1 mark)

Time is independent
Temperature is dependent

b) Is the relationship linear, quadratic or exponential? Give reasons for your answer. Hint: Use the results from the regression analysis on the graphing calculator. (4 marks)

linear regression $r^2 = 0.8326$
quadratic regression $R^2 = 0.9799$

c) What is the equation of the line of best fit? Write the equation using functional notation. (3 marks)

Best fit \rightarrow Exponential regression $r^2 = 0.9989$
 $T(m) = 98.4(0.99)^m$

d) Use your equation in part (b) to determine when what the temperature will be at 3 minutes. Show all workings. (3 marks)

$T(3) = 98.4(0.99)^3$

$T(3) = 71.7^\circ\text{C}$

The temperature at 3 minutes will be 71.7°C

Due Date: Thursday, January 19, 2006

Mark out of 80
Page 12 of 12

5) For $f(x) = 2x + 1$ solve the following: (3 marks)

a) $f(8) = 2(8) + 1 = 16 + 1 = 17$

b) x if $f(x) = 3$

$$3 = 2x + 1$$

$$3 - 1 = 2x + 1 - 1$$

$$2 = 2x$$

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

$$x = 1$$

6) For $m(w) = -3w^2 - 2w$ solve the following: (3 marks)

a) $m(-5) = -3(-5)^2 - 2(-5)$

$$= -3(25) + 10$$

$$= -75 + 10 = -65$$

b) w if $m(w) = -8$

$$-8 = -3w^2 - 2w$$

$$0 = -3w^2 - 2w + 8$$

$$0 = (-3w^2 - 6w) + (4w + 8)$$

7) For $p(y) = 3(2)^y - 5$ solve the following: (3 marks)

a) $p(2.7) = 3(2)^{2.7} - 5$

b) y if $p(y) = 19$

$$19 = 3(2)^y - 5$$

$$19 + 5 = 3(2)^y - 5 + 5$$

$$24 = 3(2)^y$$

$$\frac{24}{3} = \frac{3(2)^y}{3}$$

$$8 = 2^y$$

$$2 \times 2 \times 2 = 8$$

$$2^3 = 8$$

$$2^3 = 2^y$$

$$3 = y$$

$$x = \frac{1}{4}$$

$$\frac{3}{3} = \frac{3}{3}$$

$$\frac{3}{3} = \frac{3}{3}$$

$$3 - 3 = 0$$

$$0 = (x+2)(-3x+4)$$

$$0 = x+2 \quad 0 = -3x+4$$

$$-2 = x+2-2 \quad 0-4 = -3x+4-4$$

$$-2 = x \quad -4 = -3x$$