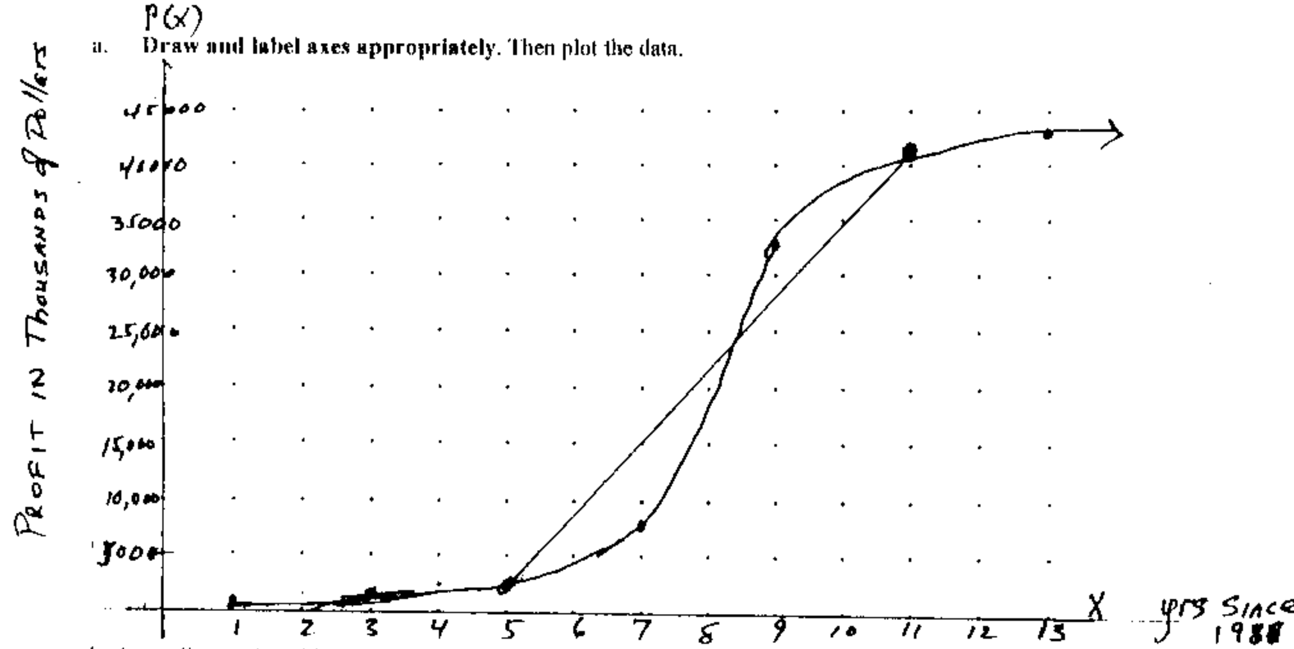
MTH U131 Quiz 2 Review

1. The following table gives the approximate profit of a high tech company, in thousands of dollars, x years after 1988.

x (years after 1988)	1	3	5	7	9	11	13
Profit (thousands of $s)	500	1000	2000	8500	33000	41000	43000

a. **Draw and label axes appropriately**. Then plot the data.



b. According to the table, what was the change in profit between 1993 and 1999? Show work and give the units in your answer $I(11) - I(5) = \$39,000,000$

c. According to the table, what was the percent change in profit between 1993 and 1999? Show work.

$100 \times (I(11) - I(5))/I(5) =$ 1950 Per Cent

d. According to the table, what was the average rate of change in profit between 1993 and 1999? Show work and give the units for your answer

$$\frac{I(11) - I(5)}{11 - 5} = \frac{39,000,000}{6} = 6,500,000 \ \$/yr$$

e. **Draw and label** a line segment through two of the points that you plotted in part (a) whose slope is given by the answer to part (d). See Figure

f. Let **x stand for the number of years since 1988** and let P(x) stand for the profit in year x. Fit a **LOGISTIC MODEL** to the data. Round off all coefficients involved to 3 decimal places. Include units in your answer.

$$P(x) \approx L(x) = \frac{42638387.595}{1 + 26358.517\, e^{-1.262x}}$$

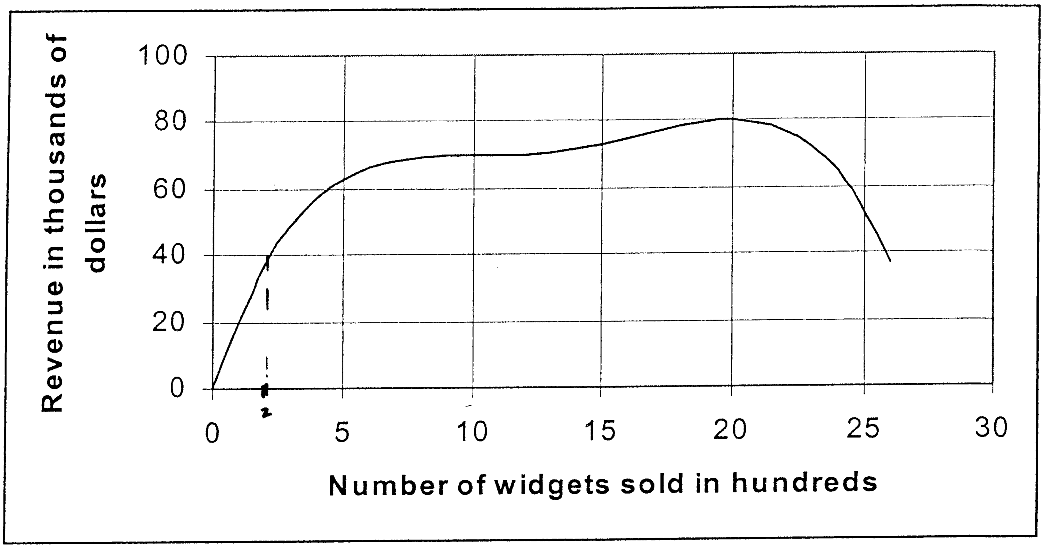
g. According to the model in part (f) what was the profit in 2000? Show work and give the units for your answer.

$P(12) \approx L(12) = \$42,346,262.48$

h. Use the model in part (f) to approximate the average rate of change of profit from 1996 to 2000. Show work and give the units for your answer.

$$\frac{L(12) - L(8)}{12 - 8} = 5,457,995.89 \ \$/yr$$

2. Each month a manufacturer of widgets keeps track of his revenue and the number of widgets he sells. This relationship is given by the following graph.



(a) When the number of widgets sold increases from 500 to 2000, the percentage change in revenue is:

positive   negative   zero   (circle one)

(b) When 2300 widgets are sold, the instantaneous rate of change of revenue is:

positive   negative   zero   (circle one)

(c) The average rate of change in revenue when the number of widgets sold increases from 1000 to 2000 is:

positive   negative   zero   (circle one)

(d) When 1000 widgets are sold, the revenue is:

increasing   decreasing   neither   (circle one)

(e) The instantaneous rate of change of revenue when 300 widgets are sold is:

positive   negative   zero   (circle one)

(f) Estimate and **list the specific value(s)** of the number of widgets sold, for which the <u>derivative</u> of the revenue is zero. Your answer should be a list, **not** a range of values.

$x = 1000$ Widgets and $x = 2000$ Widgets

(g) Estimate the revenue when the number of widgets sold is 200. Give units.

Revenue $\approx \$40,000$

(h) Estimate the change in revenue when the number of widgets sold increases from 200 to 1000. Show work and give units.

Rev. at 200 widgets ≈ 40000
Rev. at 1000 widgets ≈ 70000

Change in Rev. $\approx \$30,000$

(i) Estimate the average rate of change of revenue when the number of widgets sold increases from 200 to 1000. Show work and give units.

$ AROC = \frac{70000 - 4000}{1000 - 200} = \frac{30000}{800} = 37.50 \frac{\text{Dollars}}{\text{Widget}} $