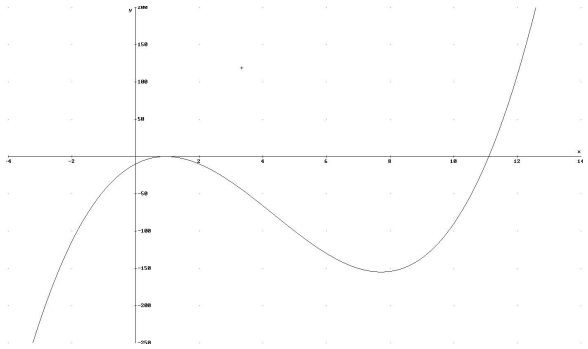
Term I Test Answer Sheet

Question 1

a 

b Roots: 0.90, 1.00, 11.10. Minimum: $(7.72, -154.84)$. Maximum: $(0.95, 0.02)$

c Iteration scheme (Newton's method):

$$x_{n+1} = x_n - \frac{x^3 - 13x^2 + 22 - 10}{3x^2 - 26x + 22}$$

d Roots (with initial guesses 0.9, 1.0 and 11.0 respectively): 0.9010, 1.0000, 11.0990.

Question 2

a

$$\begin{pmatrix} 1 & 1 & 1 \\ 2 & 4 & 3 \\ 2 & 6 & 3 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 1 \\ 3 \\ 4 \end{pmatrix}$$

b

$$A^{-1} = \begin{pmatrix} 3 & -\frac{3}{2} & \frac{1}{2} \\ 0 & -\frac{1}{2} & \frac{1}{2} \\ -2 & 2 & -1 \end{pmatrix}$$

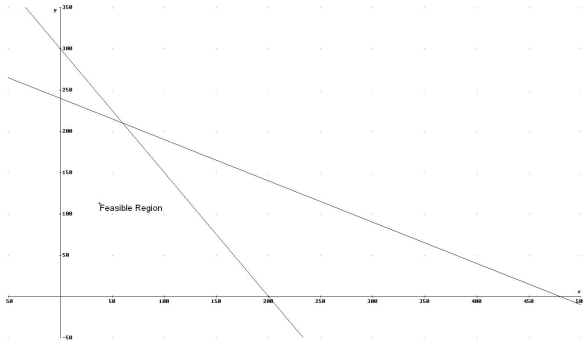
c $x = 1/2$, $y = 1/2$, $z = 0$.

d The modified matrix A no longer has an inverse. This means either (i) no solutions or (ii) an infinite number of solutions. Since the solution to part c is still a solution there is clearly an infinite number.

Question 3

a $P = 10x + 15y - 2400$.

b Two constraints are $x/2 + y/3 \leq 100$ and $x/6 + y/3 \leq 80$. Other inequalities are $x \geq 0$ and $y \geq 0$.

c 

d Maximum profit is acieved when $x = 60$, $y = 210$ giving a profit of £1350.