**Homework 9 Solutions M331 Fall 2002**

Average Score:

6.1. Let $N_j$ be Neighborhood $j$ (There are $P$ of them, i.e. $P = 1..j$). Let $w_{ij}$ be the number of students going to school $i$ from $N_j$ Let $r_j$ be the number of students residing in $N_j$ Let $c_i$ be the capacity of school $i$ Let $(x_j, y_j)$ be the center of $N_j$ Let $(a_i, b_i)$ be the location of school $i$ Then our program is:

$$min \sum_{i=1}^{S} \sum_{j=1}^{P} w_{ij} \sqrt{(a_i - x_j)^2 + (b_i - y_j)^2}$$

such that

$$\sum_{j=1}^{P} w_{ij} \leq c_i$$

$$\sum_{i=1}^{S} w_{ij} = r_j$$

6.2. Let $f(x) = x^2 - 3$. Then the root of $f(x)$ will be where $x = \sqrt{3}$ The iteration is

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

In our case, the iteration is

$$x_{n+1} = x_n - \frac{(x_n)^2 - 3}{2x_n}$$

If you choose $x_0 = 3$ then $x_1 = 2, x_2 = \frac{7}{4}, x_3 = \frac{97}{56}$ which converges to $\sqrt{3}$

6.3.

$$f(x) = 7x_1^2 + 2x_1x_2 + x_2^2$$

$$\nabla f = (14x_1 + 2x_2, 2x_1 + 2x_2)^T$$

$$Hf = \begin{matrix} 14 & 2 \\ 2 & 2 \end{matrix}$$