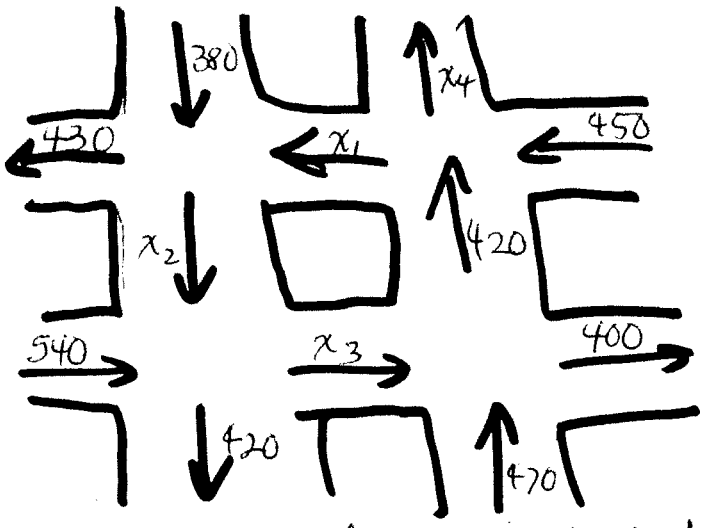
Mathematics 2360
Quiz 1
Jan 21, 2010

Name (please print) Solution

I. (5) Determine the values of x_1, x_2, x_3 and x_4 for the following traffic flow diagram:



The number of cars entering each intersection must equal the number of cars leaving:

$x_1 + 380 = x_2 + 430 \rightarrow x_1 - x_2 = 50$

$x_2 + 540 = x_3 + 420 \rightarrow x_2 - x_3 = -120$

$x_3 + 470 = 420 + 400 \rightarrow x_3 = 350$

$x_4 + x_1 = 420 + 450 \rightarrow x_4 + x_1 = 870$

$$\left[\begin{array}{cccc|c} 1 & -1 & 0 & 0 & 50 \\ 0 & 1 & -1 & 0 & -120 \\ 0 & 0 & 1 & 0 & 350 \\ 1 & 0 & 0 & 1 & 870 \end{array}\right] \sim \left[\begin{array}{cccc|c} 1 & -1 & 0 & 0 & 50 \\ 0 & 1 & -1 & 0 & -120 \\ 0 & 0 & 1 & 0 & 350 \\ 0 & 1 & 0 & 1 & 820 \end{array}\right] \sim \left[\begin{array}{cccc|c} 1 & -1 & 0 & 0 & 50 \\ 0 & 1 & -1 & 0 & -120 \\ 0 & 0 & 1 & 0 & 350 \\ 0 & 0 & 1 & 1 & 940 \end{array}\right]$$

$$\sim \left[\begin{array}{cccc|c} 1 & -1 & 0 & 0 & 50 \\ 0 & 1 & -1 & 0 & -120 \\ 0 & 0 & 1 & 0 & 350 \\ 0 & 0 & 0 & 1 & 590 \end{array}\right] \sim \left[\begin{array}{cccc|c} 1 & -1 & 0 & 0 & 50 \\ 0 & 1 & 0 & 0 & 230 \\ 0 & 0 & 1 & 0 & 350 \\ 0 & 0 & 0 & 1 & 590 \end{array}\right] \sim \left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 280 \\ 0 & 1 & 0 & 0 & 230 \\ 0 & 0 & 1 & 0 & 350 \\ 0 & 0 & 0 & 1 & 590 \end{array}\right]$$

$x_1 = 280$, $x_2 = 230$, $x_3 = 350$, $x_4 = 590$