6.1. $\lambda = 500$

$u = 40 \text{ Km/hr} = \frac{2}{3} \text{ Km/min}$

$\tau^* = \frac{l}{u} = 20 \text{ mins} \Rightarrow l = \frac{40}{3} \text{ Km}$

$L \times (\text{Jam density}) = n_{jam}$

$\Rightarrow L = \frac{10000}{150} \text{ Km}$

For (a) and (b),

$\mu = \frac{100 \times L}{l} = \frac{\cancel{100} \times 1000\cancel{0} \times \cancel{3}}{\cancel{150} \times 4\cancel{0}} = 500$

$\rho = \frac{\lambda}{\mu} = 1$

So, we use the graphs for $\rho = 0.99$.

(a) Based on graph, the system does not reach equilibrium by $t = 8\tau^*$ based on the extent of the plot.
It reaches equilibrium at $n = 0.45 n_{jam}$
$= 4500$.

(b) Travel time at $t = 80 \text{ mins} = 4\tau^*$
$= 1.5\tau^* = 30 \text{ mins}.$

(c) After incident removal,

$$\mu = \frac{200L}{l} = 1000$$

$$\rho = \frac{500}{1000} = 0.5$$

We do not have a curve for $n(0) = .45\, n_{jam}$, but it showed closely follow $n(0) = 0.5\, n_{jam}$

It should reach equilibrium around $t = 6\tau^* = 120$ mins

and around $K_1^* = 0.15\, n_{jam}$

$= 1500$

(d) At $t = 40\text{ mins} = 2\tau^*$,

we have travel time approximately

$1.2\tau^* = 24$ mins.

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