Stochastic Processes: Assignment 1

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Importing libraries

```
#> Package:  markovchain
#> Version:  0.8.5-2
#> Date:     2020-09-07
#> BugReport: https://github.com/spedygiorgio/markovchain/issues
```

Problem 1

Problem 2

(a)

Let $N(t)$ be the number of cars arriving at a parking lot by time t, according to the proposed scenario, we can model $N(t)$ as a non-homogenous Poisson process. Such process has almost the same process as any other Poisson process, however, its rate is a function of time.

$N(t), t \in [0, \infty)$ is the non-homogenous Poisson process with rate $\lambda(t)$ where:

- $N(0) = 0$
- $N(t)$ has independent increments

We define 8:00 as $t = 0$ with the following integrable function and each unit of t equals to 1 hour:

$$\lambda(t) = \begin{cases} 100 & 0 \le t \le \frac{1}{2} \\ 600t - 200 & \frac{1}{2} \le t \le \frac{3}{4} \\ 400t - 50 & \frac{3}{4} \le t \le 1 \\ -500t + 850 & 1 \le t \le 1.5 \end{cases}$$

So,

$E[N(t)] = \{$

lots of latex here

(b)

```
#> Call:
#> testnslv(x = 0, fn = f)
#>
#> Results:
#>     Method Global termcd Fcnt Jcnt Iter Message     Fnorm
#> 1   Newton  cline      1    6    6    6   Fcrit 1.541e-31
#> 2   Newton  qline      1    6    6    6   Fcrit 1.541e-31
```

```
#> 3   Newton  gline       1    6    6    6   Fcrit 1.541e-31
#> 4   Newton pwldog       1    6    6    6   Fcrit 1.541e-31
#> 5   Newton dbldog       1    6    6    6   Fcrit 1.541e-31
#> 6   Newton   hook       1    6    6    6   Fcrit 1.541e-31
#> 7   Newton   none       1    6    6    6   Fcrit 1.541e-31
#> 8  Broyden  cline       1    7    1    7   Fcrit 2.392e-17
#> 9  Broyden  qline       1    7    1    7   Fcrit 2.392e-17
#> 10 Broyden  gline       1    7    1    7   Fcrit 2.392e-17
#> 11 Broyden pwldog       1    7    1    7   Fcrit 2.392e-17
#> 12 Broyden dbldog       1    7    1    7   Fcrit 2.392e-17
#> 13 Broyden   hook       1    7    1    7   Fcrit 2.392e-17
#> 14 Broyden   none       1    7    1    7   Fcrit 2.392e-17
```