

Differential Equations, Fall 2019
Multiple Doses Final Solution

Name: _____

Find 3 drug administration plans that meet the minimum criteria:

1. The level of the drug is between 2 mg and 4 mg for the entire 24 hour period.
2. The drug can only be administered, in any amount, for 30 minutes of each hour long time period.

Your solutions should:

1. For each drug administration plan give the function $f(t)$ that represents the plan. In your Matlab file show the 3 functions: call them $f(t)$. You can comment out 2 at a time and run the code.
2. Use the method of Laplace transforms to solve the differential equation.
3. Show plots for the solutions $q(t)$.
4. Show plots for the administration plans that use the Heaviside function. You don't need to show plots for plans that use the dirac function, but you might want to make sure the functions do what you think they do by evaluating the functions at a few values of t .
5. At least one plan should use boluses, at least one should use continuous drip.
6. Once you have $q(t)$ for each plan find the total amount of drug used by evaluating $\int_0^{24} q(t) dt$.
7. Estimate from the graphs of $q(t)$ the maximum value of drug in the blood stream and the minimum value of drug in the blood stream for each plan.

Turn in:

- Summarize your results on the back of this sheet.
- Submit your Matlab file: as a .mlx file on Canvas.

Challenge:

- Find a plan that uses the least total amount of drug.
- Find a plan that has the smallest maximum amount in the blood.
- Find a plan that has the largest minimum amount in the blood.
- Find a plan that has the smallest swing between minimum and maximum.

Plan 1	
$f(t) =$	
total drug used:	
max drug in blood:	
min drug in blood:	
swing: max – min:	

Plan 2	
$f(t) =$	
total drug used:	
max drug in blood:	
min drug in blood:	
swing: max – min:	

Plan 3	
$f(t) =$	
total drug used:	
max drug in blood:	
min drug in blood:	
swing: max – min:	