Ryan Fahrenkrug

MECH 105

Homework 15

10/13/2017

```
clc
clear
close all
```

Part 1

$$0 = D\frac{d^2c}{dx^2} - U\frac{dc}{dx} - kc$$

$$0 = D\left[\frac{c_{i+1} - 2c_i + c_{i-1}}{\Delta x^2}\right] - U\left[\frac{c_{i+1} - c_{i-1}}{2\Delta x}\right] - kc_i$$

$$0 = \left[\frac{D}{\Delta x^2} - \frac{U}{2\Delta x}\right]c_{i+1} - \left[\frac{2D}{\Delta x^2} + k\right]c_i + \left[\frac{D}{\Delta x^2} + \frac{U}{2\Delta x}\right]c_{i-1}$$

Part 4

```
% Initialized variables
L=10;
dx=0.5;
D=2;
U=1;
k=0.2;
c0=80;
cL=20;
```

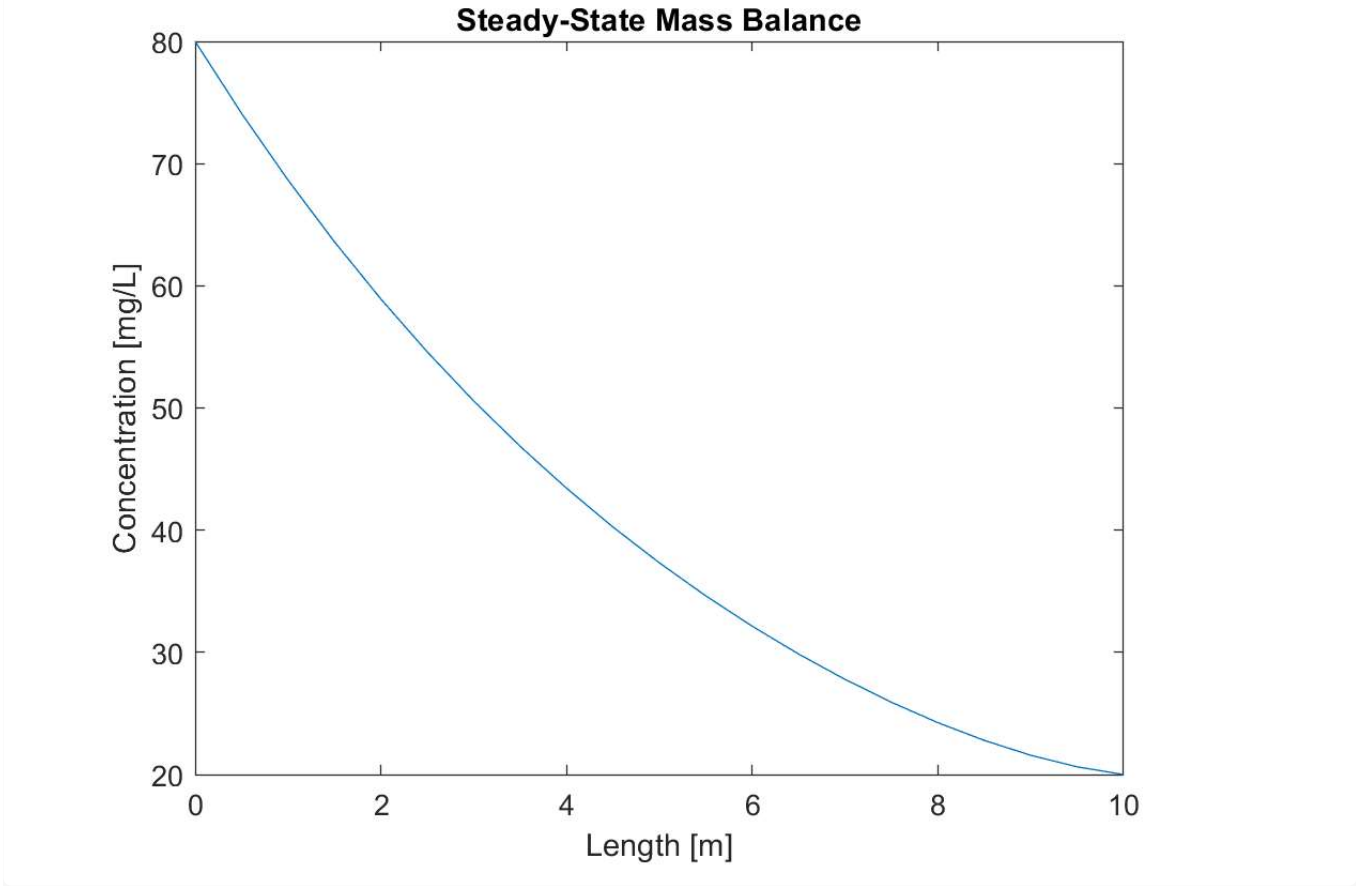
Part 2

I know its out of order but the variables need to be initilized first.

```
[x,c]=Fahrenkrug_reactor(D,U,k,c0,cL,L,dx);
```

Part 3

```
plot(x,c)
xlim([0 10])
ylim([20 80])
title('Steady-State Mass Balance')
xlabel('Length [m]')
ylabel('Concentration [mg/L]')
```


Steady-State Mass Balance
Concentration [mg/L]
Length [m]
80
70
60
50
40
30
20
0
2
4
6
8
10