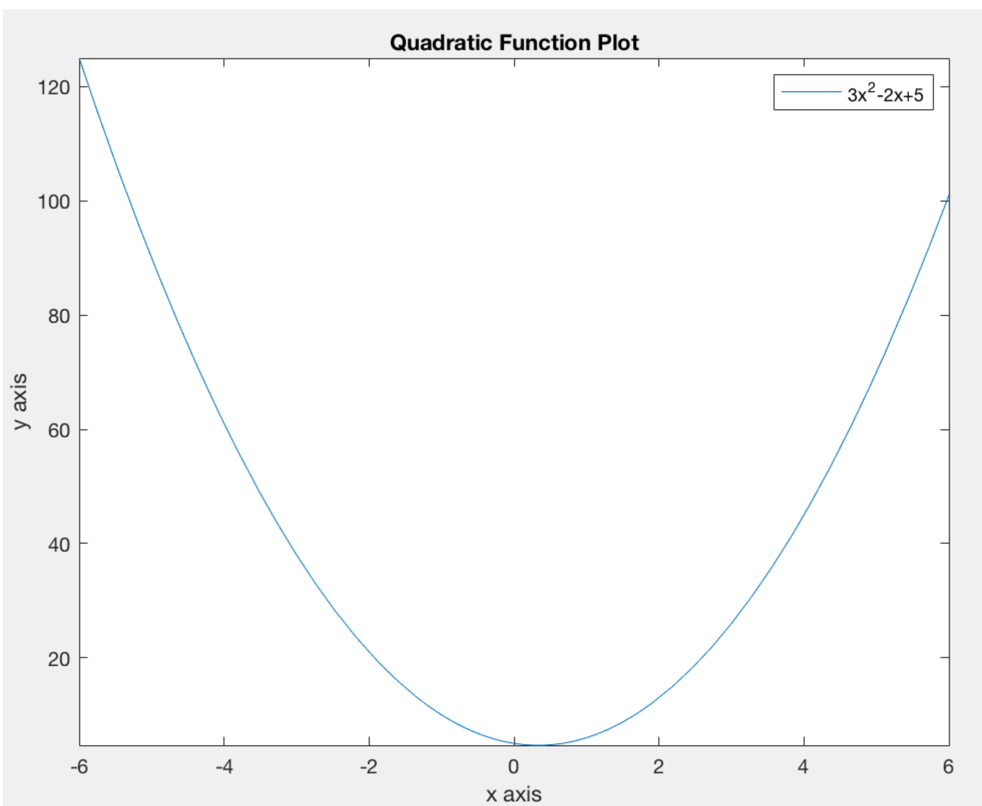
% QuadraticPlot.m
% Patrick Utz, 4/13/18, 12.1

% Description: Write an anonymous function to implement the following
% quadratic: 3x2-2x+5. Then, use fplot to plot the function in the range
% from -6 to 6

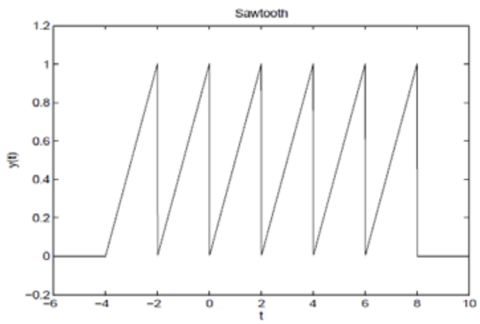
% Variables: quadratic = anonymous function that handles a quadratic

```
clear

quadratic = @(x) 3.*(x.^2)-(2.*x)+5;
fplot(quadratic,[-6,6]);
title('Quadratic Function Plot');
xlabel('x axis');
ylabel('y axis');
legend('3x^2-2x+5');
```



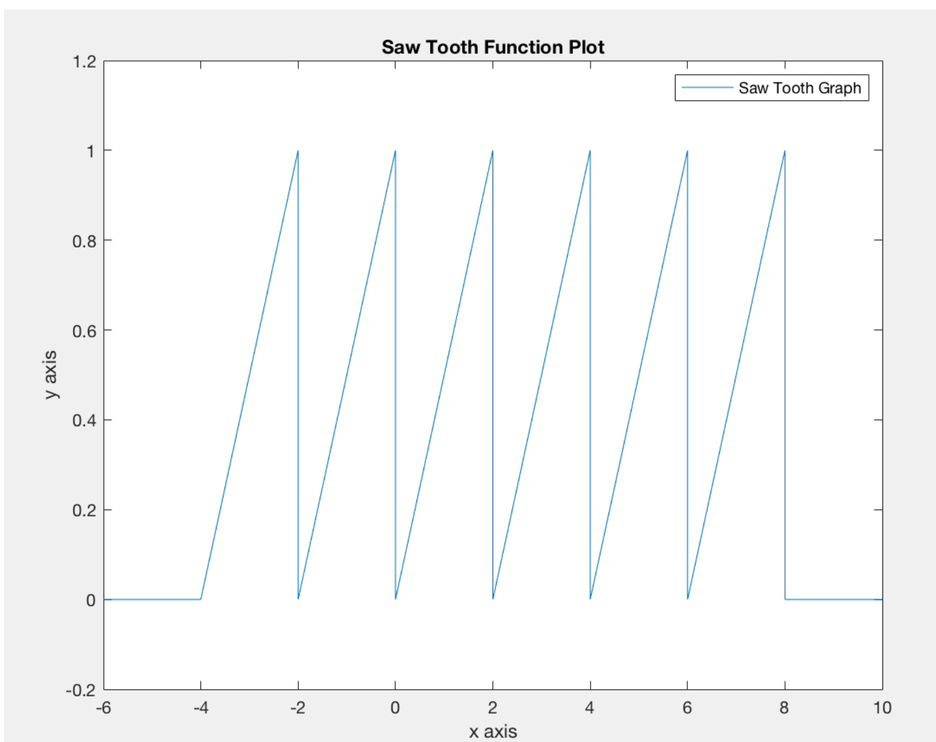
% SawToothPlot.m
% Patrick Utz, 4/13/18, 12.2

% Description: Write a program to plot the following saw-tooth function
% as shown.



% Variables: sawTooth = anonymous function that creates the sawtooth

```
clear
% x = linspace(-6,10,100)
sawTooth = @(x) 0*(x<-4)+(.5*x+2).*(x>-4 & x<=-2)+(.5*x+1).*(x>-2 & ...
        x<=0)+(.5*x).*(x>0 & x<=2)+(.5.*x-1).*(x>2 & x<=4)+(.5.*x-2)...
        .*(x>4 & x<=6)+(.5.*x-3).*(x>6 & x<=8)+0*(x>8);
fplot(sawTooth,[-6 10]);
axis([-6 10 -.2 1.2])
title('Saw Tooth Function Plot');
xlabel('x axis');
ylabel('y axis');
legend('Saw Tooth Graph');
```



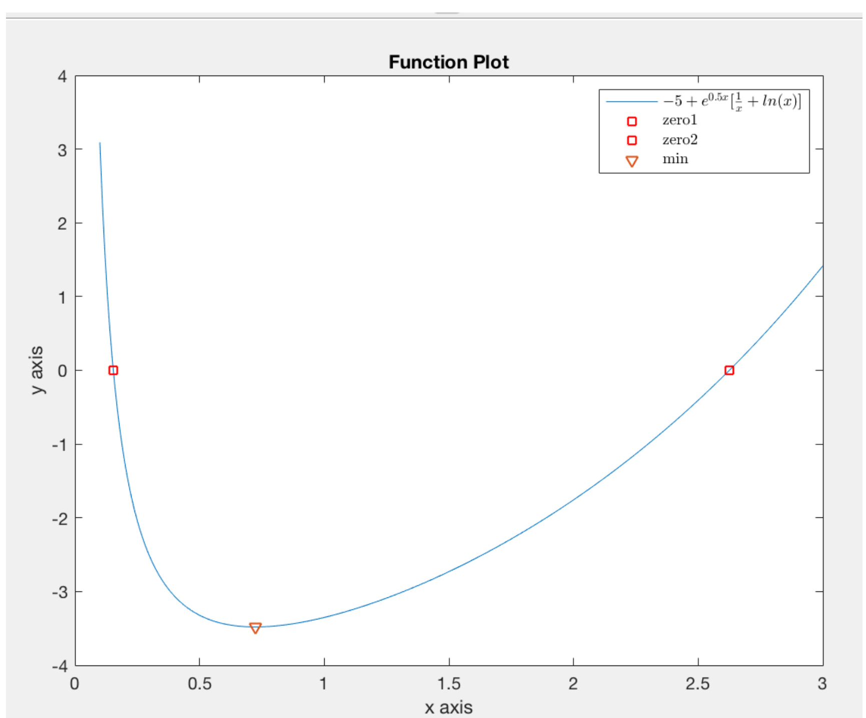
% Prob3EquationPlotter.m
% Patrick Utz, 4/13/18, 12.3

% Description: Write and run a MATLAB program that uses the function
% given below and does the following: (1) create an anonymous function;
% (2) plot the function over the x range from 0.1 to 3 with maximum step
% size 0.01; (3) properly label the x and y axes and put the function in
% the plot title using TeX symbols; (4) use the fzero function to find
% the roots of the equation over the interval given (you need to do this
% twice since you need 2 different starting points to find the zeros);
% (5) plot the 2 resulting points on your plot as red squares; (6) use
% the fminbnd function to find the minimum and plot it on your plot as
% a downward pointing triangle. Hand in the program that does all of the
% above and the plot resulting from running the program.

$$f(x) = -5 + e^{0.5x}[\frac{1}{x} + \ln(x)]$$

% Variables: equationS = anonymous function that sets up the equation,
% zeroX = zeros of the function, minimum = x value where minimum value of
% the function occurs

```
clear
x = [.1:.01:3];
equationS = @(x) (exp(.5.*x).*( (1./x) + (log(x))))-5;
plot(x,equationS(x));
hold on
title('Function Plot')
xlabel('x axis')
ylabel('y axis')
legend({'$-5 + e^{0.5x}[ \frac{1}{x}+ ln(x)]$'},'Interpreter','latex')

zeros1 = fzero(equationS,[.1 1])
zeros2 = fzero(equationS,[1 4])
plot(zeros1, 0, 'rs')
plot(zeros2, 0, 'rs')

minimum = fminbnd(equationS,.1,3)
plot(minimum, equationS(minimum), 'v')
```



% Prob4LogScalePlotting.m
% Patrick Utz, 4/13/18, 12.4

% Description: Explore the log scale plotting functions semilogx,
% semilogy and loglog. Using a log scale plot can reveal large dynamic
% ranges, which is common in many engineering applications. For example,
% a frequency-selective amplifier is designed to have its gain amplitude
% G as a function of frequency f (in Hz), as described in the following
% equation:

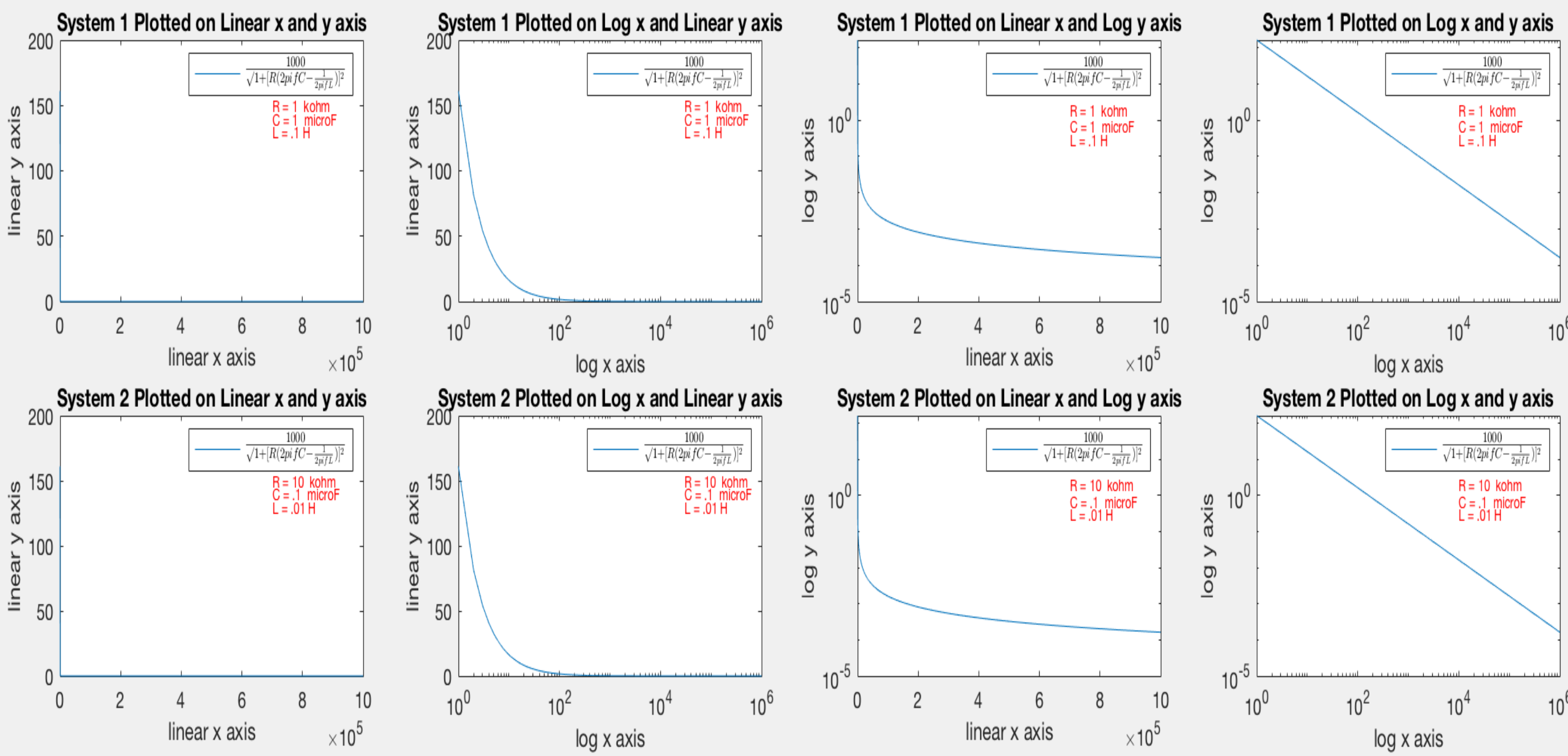
$G = \frac{1000}{\sqrt{1+[R(2\pi fC - \frac{1}{2\pi fL})]^2}}$, where R L C are resistor, inductor and capacitor values used in the system.
Write a MATLAB script file that will plot the gain amplitude v.s. frequency f over the range of 1 to 1M Hz (1x10^6 Hz), for two different systems:
1) R = 1kΩ, C = 1µF, and L = 0.1H; and 2) R = 10kΩ, C = 0.1µF, and L = 0.01H.

% For each of the system, create 4 subplots, the first one using linear x
% and y axis, the second one using log x axis but linear y axis, the third
% one using linear x axis but log y axis, and the last one using both log x
% and y axis. Compare the two systems in the same subplot figures. Use
% appropriate labels, titles and legends for all your plots. Make sure the
% system component values are presented in the figure.
% Variables: r = resistor value; c = capacitor value; l = inductor value;
% f = frequency; g = gain amplitude

```
clear
r1 = 1
r2 = 10
c1 = 1
c2 = .1
l1 = .1
l2 = .01
f = 1:10^6;

% System 1
g = 1000./(sqrt(1+ (r1.*(2.*pi.*f.*c1 - (1/2.*pi.*f.*l1)) ).^2 ));
subplot(4,4,1)
plot(f,g)
title('System 1 Plotted on Linear x and y axis')
xlabel('linear x axis')
ylabel('linear y axis')
legend({'$\frac{1000}{\surd{1+[R(2pifC-\frac{1}{2pifL})]^2}}$'},'Interpreter','latex')
text(700000,150,'R = 1  kohm','Color','red','FontSize',7)
text(700000,140,'C = 1  microF','Color','red','FontSize',7)
text(700000,130,'L = .1 H','Color','red','FontSize',7)

subplot(4,4,2)
semilogx(f,g);
title('System 1 Plotted on Log x and Linear y axis')
```

```
xlabel('log x axis')
ylabel('linear y axis')
legend({'$\frac{1000}{\surd{1+[R(2pifC-\frac{1}{2pifL})]^2}}$'},'Interpreter','latex')
text(30000,150,'R = 1  kohm','Color','red','FontSize',7)
text(30000,140,'C = 1  microF','Color','red','FontSize',7)
text(30000,130,'L = .1 H','Color','red','FontSize',7)

subplot(4,4,3)
semilogy(f,g);
title('System 1 Plotted on Linear x and Log y axis')
xlabel('linear x axis')
ylabel('log y axis')
legend({'$\frac{1000}{\surd{1+[R(2pifC-\frac{1}{2pifL})]^2}}$'},'Interpreter','latex')
text(700000,2,'R = 1  kohm','Color','red','FontSize',7)
text(700000,.7,'C = 1  microF','Color','red','FontSize',7)
text(700000,.3,'L = .1 H','Color','red','FontSize',7)

subplot(4,4,4)
loglog(f,g);
title('System 1 Plotted on Log x and y axis')
xlabel('log x axis')
ylabel('log y axis')
legend({'$\frac{1000}{\surd{1+[R(2pifC-\frac{1}{2pifL})]^2}}$'},'Interpreter','latex')
text(10000,2,'R = 1  kohm','Color','red','FontSize',7)
text(10000,.7,'C = 1  microF','Color','red','FontSize',7)
text(10000,.3,'L = .1 H','Color','red','FontSize',7)

% System 2
g2 = 1000./(sqrt(1+ (r2.*(2.*pi.*f.*c2 - (1/2.*pi.*f.*l2)) ).^2 ));
subplot(4,4,5)
plot(f,g2)
title('System 2 Plotted on Linear x and y axis')
xlabel('linear x axis')
ylabel('linear y axis')
legend({'$\frac{1000}{\surd{1+[R(2pifC-\frac{1}{2pifL})]^2}}$'},'Interpreter','latex')
text(700000,150,'R = 10  kohm','Color','red','FontSize',7)
text(700000,140,'C = .1  microF','Color','red','FontSize',7)
text(700000,130,'L = .01 H','Color','red','FontSize',7)

subplot(4,4,6)
semilogx(f,g2);
title('System 2 Plotted on Log x and Linear y axis')
xlabel('log x axis')
ylabel('linear y axis')
legend({'$\frac{1000}{\surd{1+[R(2pifC-\frac{1}{2pifL})]^2}}$'},'Interpreter','latex')
text(30000,150,'R = 10  kohm','Color','red','FontSize',7)
text(30000,140,'C = .1  microF','Color','red','FontSize',7)
text(30000,130,'L = .01 H','Color','red','FontSize',7)
```

```
subplot(4,4,7)
semilogy(f,g2);
title('System 2 Plotted on Linear x and Log y axis')
xlabel('linear x axis')
ylabel('log y axis')
legend({'$\frac{1000}{\surd{1+[R(2pifC-\frac{1}{2pifL})]^2}}$'},'Interpreter','latex')
text(700000,2,'R = 10  kohm','Color','red','FontSize',7)
text(700000,.7,'C = .1  microF','Color','red','FontSize',7)
text(700000,.3,'L = .01 H','Color','red','FontSize',7)

subplot(4,4,8)
loglog(f,g2);
title('System 2 Plotted on Log x and y axis')
xlabel('log x axis')
ylabel('log y axis')
legend({'$\frac{1000}{\surd{1+[R(2pifC-\frac{1}{2pifL})]^2}}$'},'Interpreter','latex')
text(10000,2,'R = 10  kohm','Color','red','FontSize',7)
text(10000,.7,'C = .1  microF','Color','red','FontSize',7)
text(10000,.3,'L = .01 H','Color','red','FontSize',7)
```


System 1 Plotted on Linear x and y axis
System 1 Plotted on Log x and Linear y axis
System 1 Plotted on Linear x and Log y axis
System 1 Plotted on Log x and y axis
System 2 Plotted on Linear x and y axis
System 2 Plotted on Log x and Linear y axis
System 2 Plotted on Linear x and Log y axis
System 2 Plotted on Log x and y axis
linear y axis
log y axis
linear x axis
log x axis
R = 1 kohm
C = 1 microF
L = .1 H
R = 10 kohm
C = .1 microF
L = .01 H