EXAM1 SOLUTION
SPRING 2002

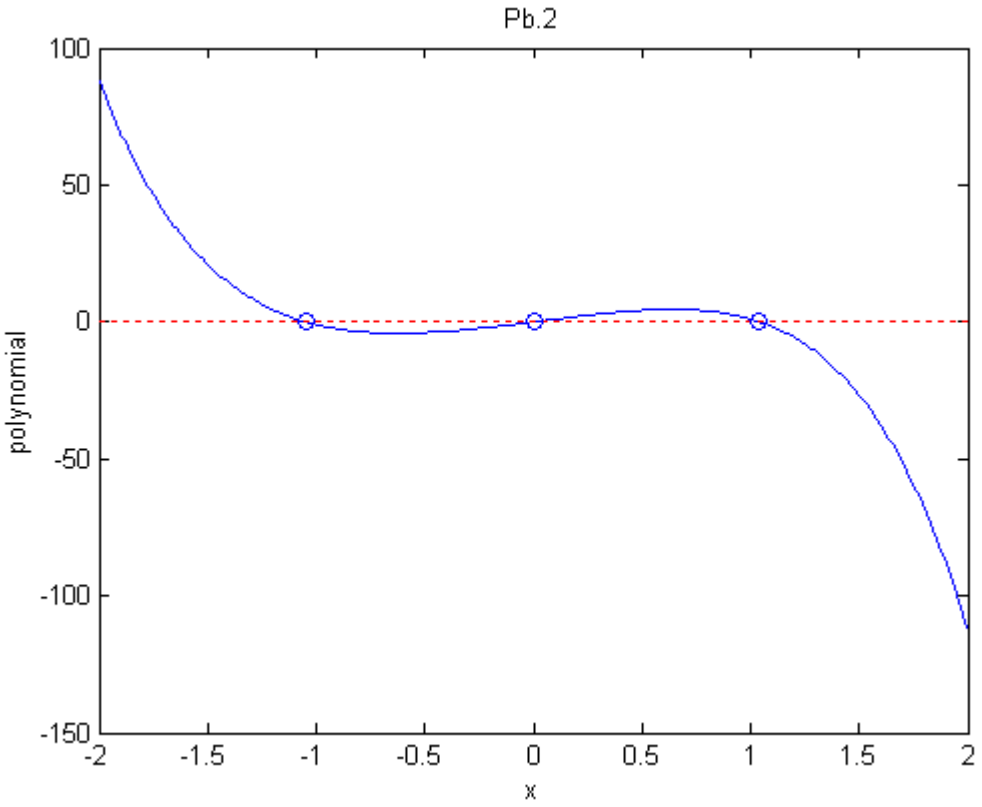
Given the polynomial: $y(x) = -2x^5 - x^4 - 7x^3 + x^2 + 10x$

a. Plot the polynomial on the interval [-2,2] and mark all the points where the polynomial crosses the x-axis with a circle. (These are the Real roots of the polynomial).
b. Determine all roots (real and complex) of the polynomial.

MATLAB Script to solve Pb.2

```
%Problem 2. first midterm
Coefv=[-2 -1 -7 1 10 0]; %define  the coefficient vector of the polynomial
x=[-2:0.01:2]; %define the interval
p=polyval(Coefv,x); %calculate polynomial values at every x
%plot and label the graph
plot(x,p,x,zeros(length(x)),':');
title('Pb.2')
xlabel('x')
ylabel('polynomial')
%find the intersection with the x-axis and plot these zeros as circles
hold on;
[xzeros,yzeros]=ginput(3);
plot(xzeros,yzeros,'o')
```

Graph:



MATLAB Command prompt Results:
The roots of the polynomial are:

```
R =

        0
  -0.2460 + 2.1274i
  -0.2460 - 2.1274i
   1.0402
  -1.0481
```

%%%

Build a MATLAB function that performs the same as MATLAB's polyval and test it by comparing it to polyval.

MATLAB M-File Function MyPolyval. Pb.3

```
function p=MyPolyval(Coefv,x)
l=length(Coefv);
p=0;
for i=1:l
    p=p+Coefv(i).*x.^(l-i);
end
```

MATLAB Command prompt Results (testing Pb.3):

```
>> p=Mypolyval([1 2 3],[1:5])

p =

     6    11    18    27    38

>> p_matlab=polyval([1 2 3],[1:5])

p_matlab =

     6    11    18    27    38
```

%%%

Find all real roots of the equation $f(x) = \sin(x) \times Log(x+6) - \frac{e^x}{x+6}$ $-5 < x < +5$

a. Use the graphical method (just get an approximate values of the roots).
b. Use the guess roots obtained in part (a) and the MATLAB Built-In function "fzero" to calculate more accurate values of the roots.

MATLAB Script to solve Pb.4

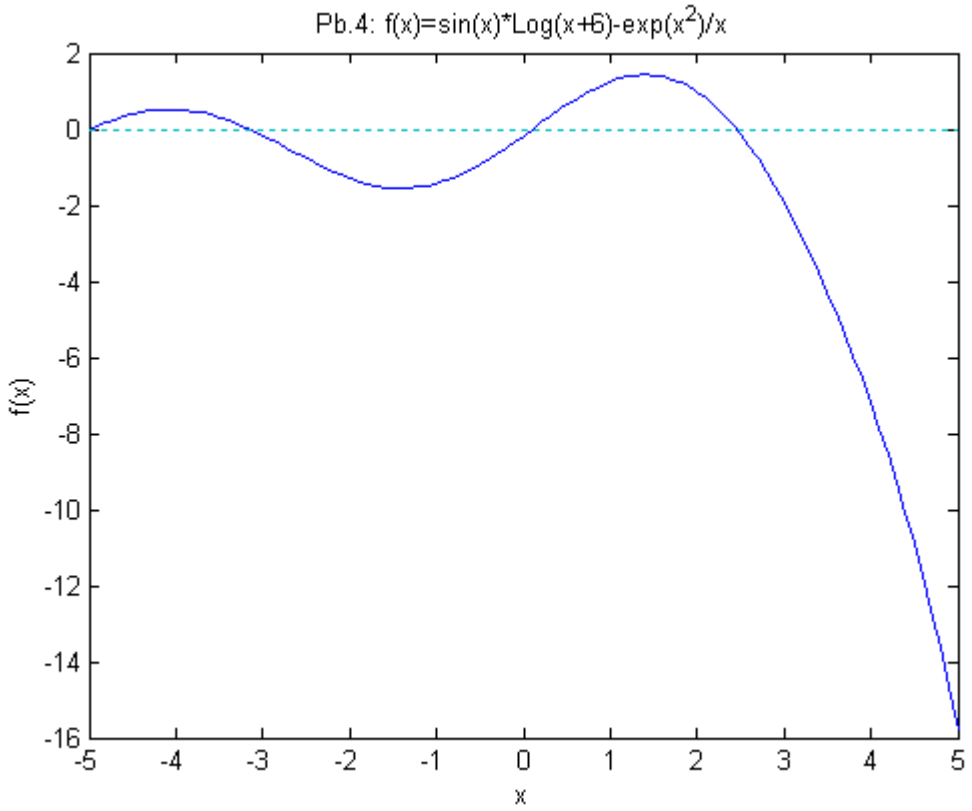
```
%script to plot the function (x)=sin(x)*Log(x+6)-exp(x)/(x+6)
x=[-5:0.1:5];%define the interval
```

```
y=pb4_exam1_sp2002(x);
plot(x,y,x,zeros(length(x)),':');
title('Pb.4: f(x)=sin(x)*Log(x+6)-exp(x)/(x+6)')
xlabel('x')
ylabel('f(x)')
```

MATLAB M-File Function pb4_exam1_sp2002

```
function y=pb4_exam1_sp2002(x)
y=sin(x).*log(x+6)-exp(x)./(x+6);
```

Graph:



MATLAB script to find the zeros of the function prompt (Pb.4)

```
%after getting all guess zeros from the graph
%-5, -3, 0, 3
%we find more approximate values using fzero
xzero1=fzero('pb4_exam1_sp2002',-5)
xzero2=fzero('pb4_exam1_sp2002',-3)
xzero3=fzero('pb4_exam1_sp2002',0)
xzero4=fzero('pb4_exam1_sp2002',3)
```

MATLAB Command prompt Results:

The x-coordinates of the polynomial zeros are:

```
xzero1 =
   -4.9930
xzero2 =
   -3.1559
xzero3 =
```

```
    0.1004
xzero4 =
    2.4463
```