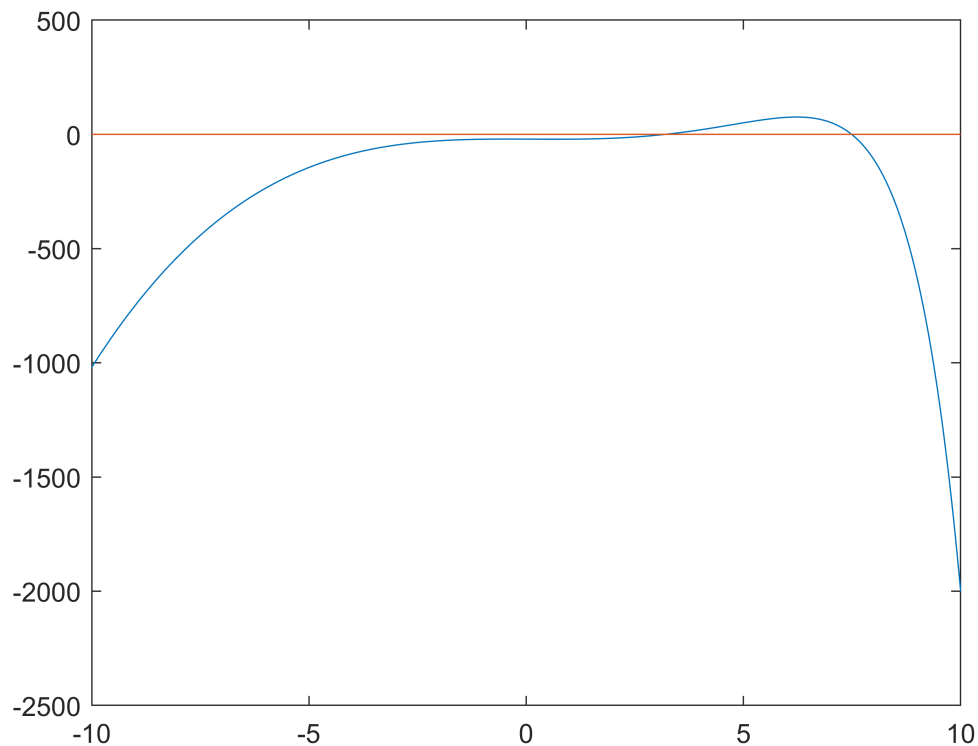


```
% Maxwell Greene  
% April 8th, 2018  
% Math Programming Homework #7
```

```
%%  
%Question #1  
disp('Question #1:');
```

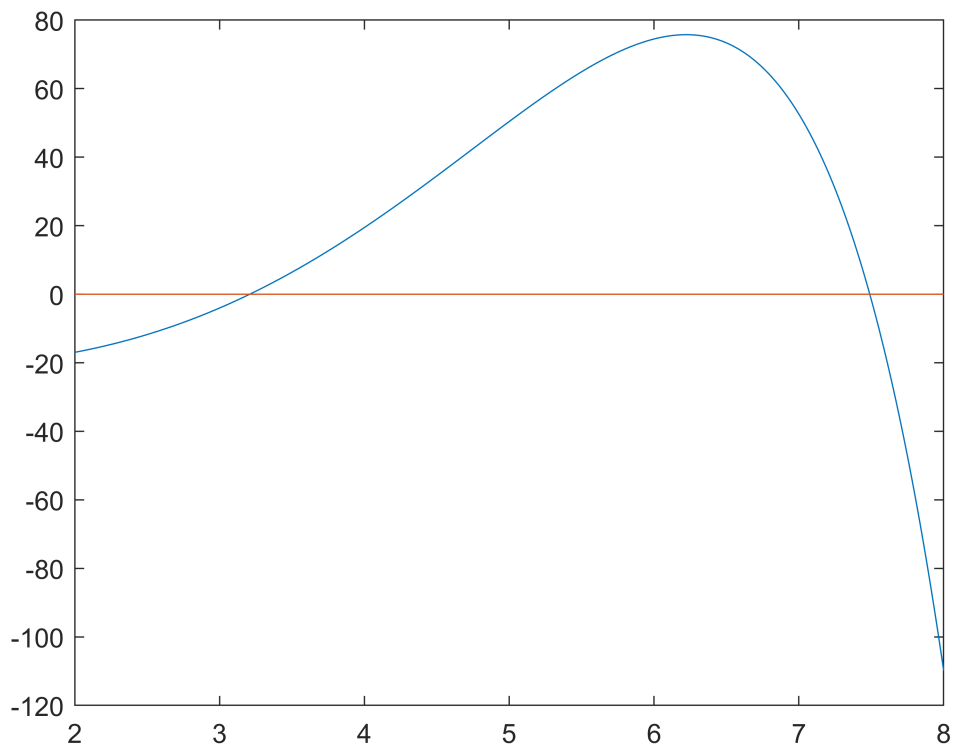
Question #1:

```
f = @(x) x.^3 - exp(0.8*x)-20;  
  
x1 = linspace(-10,10,1001);  
y1 = f(x1);  
zero1 = 0.*x1;  
figure(); plot(x1,y1,x1,zero1);
```



```
%Use this to estimate a better domain...
```

```
x2 = linspace(2,8,1001);  
y2 = f(x2);  
zero2 = 0.*x2;  
figure(); plot(x2,y2,x2,zero2);
```

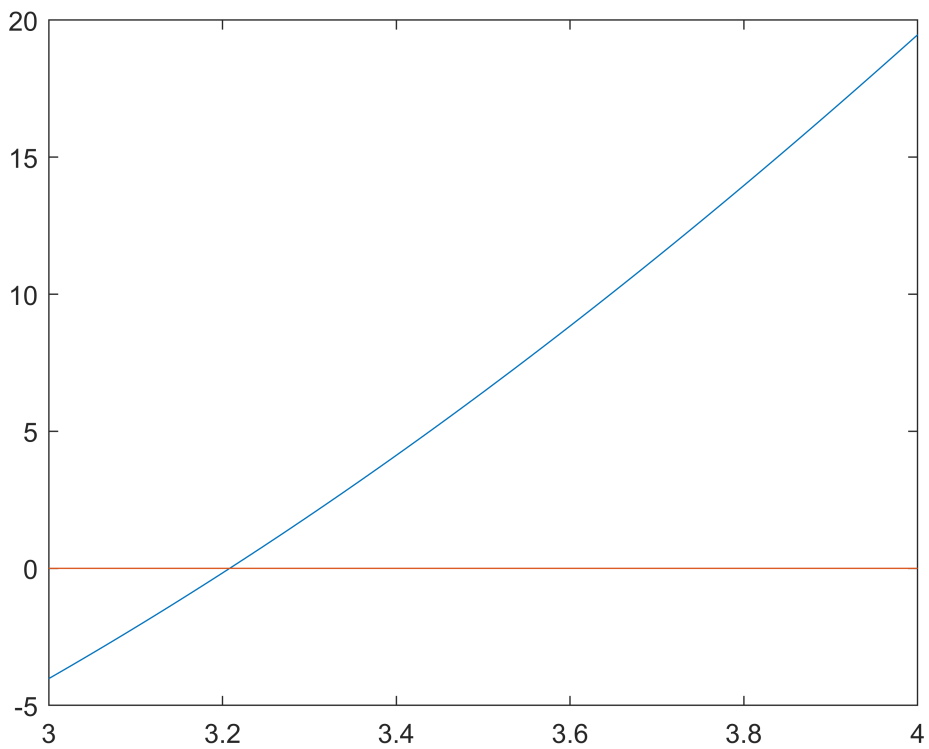


```
disp(' This function has 2 solutions.');
```

This function has 2 solutions.

```
%Now that we have a good idea of where the two zero values are, we isolate  
%them...
```

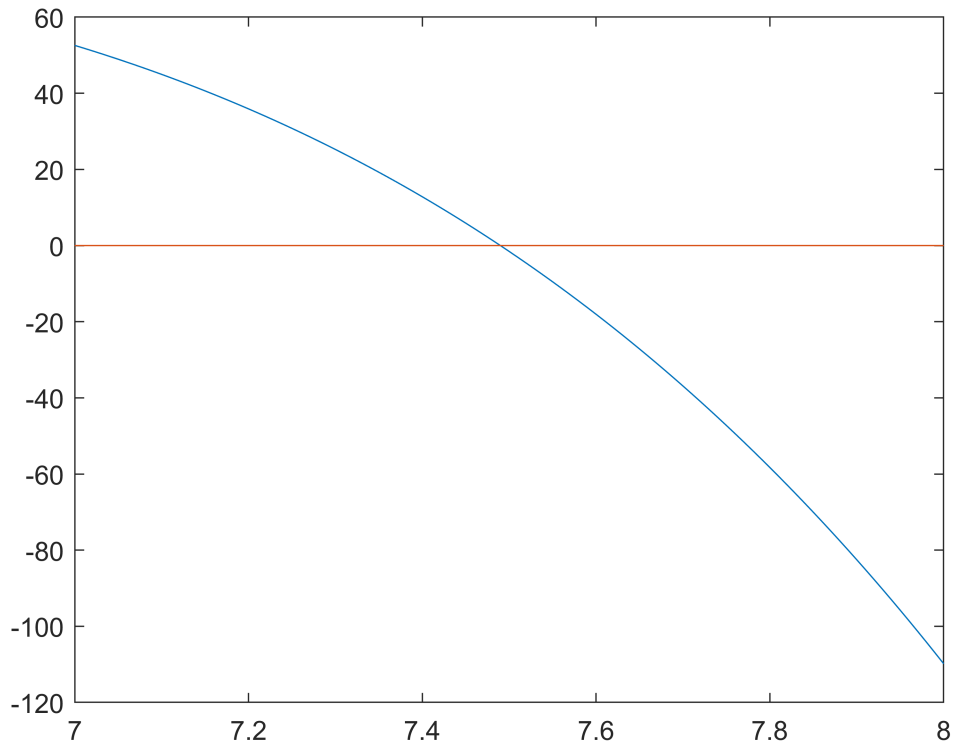
```
x3 = linspace(3,4,101);  
y3 = f(x3);  
zero3 = 0.*x3;  
figure(); plot(x3,y3,x3,zero3);
```



```
fzero3_4 = fzero(f,3);
disp([' f(x) = 0 at x = ' , num2str(fzero3_4)]);
```

f(x) = 0 at x = 3.2082

```
x4 = linspace(7,8,101);
y4 = f(x4);
zero4 = 0.*x4;
figure(); plot(x4,y4,x4,zero4);
```



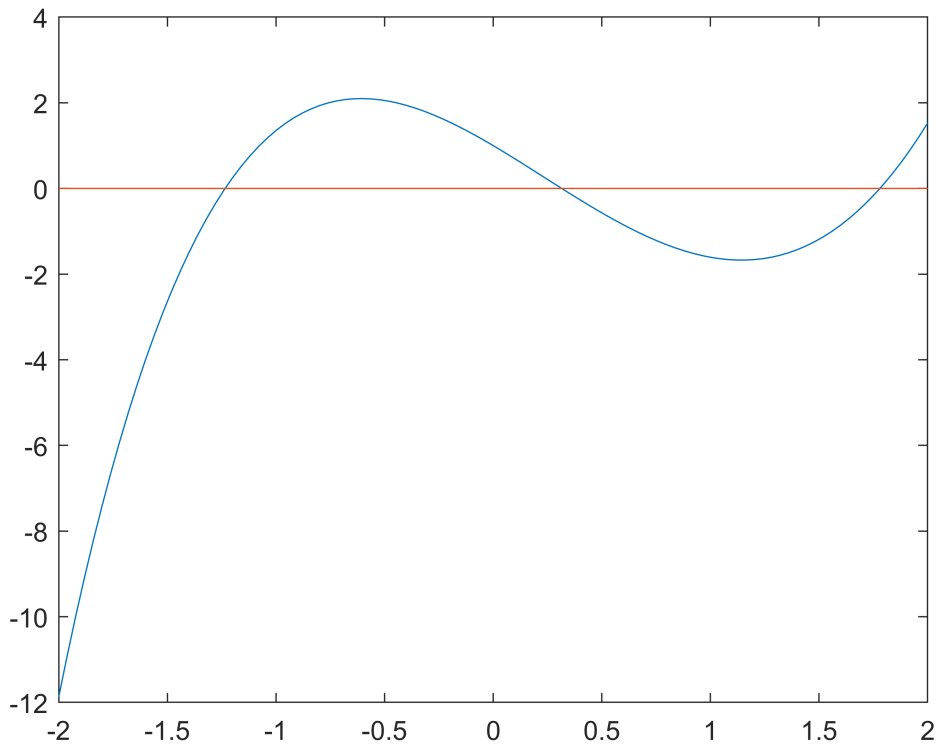
```
fzero7_8 = fzero(f,7);
disp([' f(x) = 0 at x = ' , num2str(fzero7_8)]);
```

f(x) = 0 at x = 7.4898

```
%%
%Question #2
% Find the three roots of the equation  $x^3 - (x^2) \cdot (e^{-0.5x}) - 3x = -1$ 
% Method: alter equation so that RHS is zero. Then, make LHS a function and
% find zeros fo that function. Estimate zeros with graph then use fzero fn.
disp('Question #2:');
```

Question #2:

```
f2 = @(x) x.^3 - ((x.^2) .* exp((-0.5) .* x)) - 3 .* x + 1;
x = linspace(-2,2,101);
zero = x.*0;
y = f2(x);
figure(); plot(x,y,x,zero);
```



```
%Zeros in the area of x = -1, 0, 2
```

```
fzeroN1 = fzero(f2,-1);
```

```
fzero0 = fzero(f2,0);
```

```
fzero2 = fzero(f2,2);
```

```
disp(' The three roots of this function are ',num2str(fzeroN1),', ',num2str(fzero0),', and ',num2str(fzero2));
```

The three roots of this function are -1.2341, 0.31547, and 1.7802.

```
%%
```

```
%Question #3
```

```
disp('Question #3:');
```

Question #3:

```
f3 = @(x) (2+(x-1.45).^2)./(3+3.5*(.8*x.^2-.6.*x+2));
```

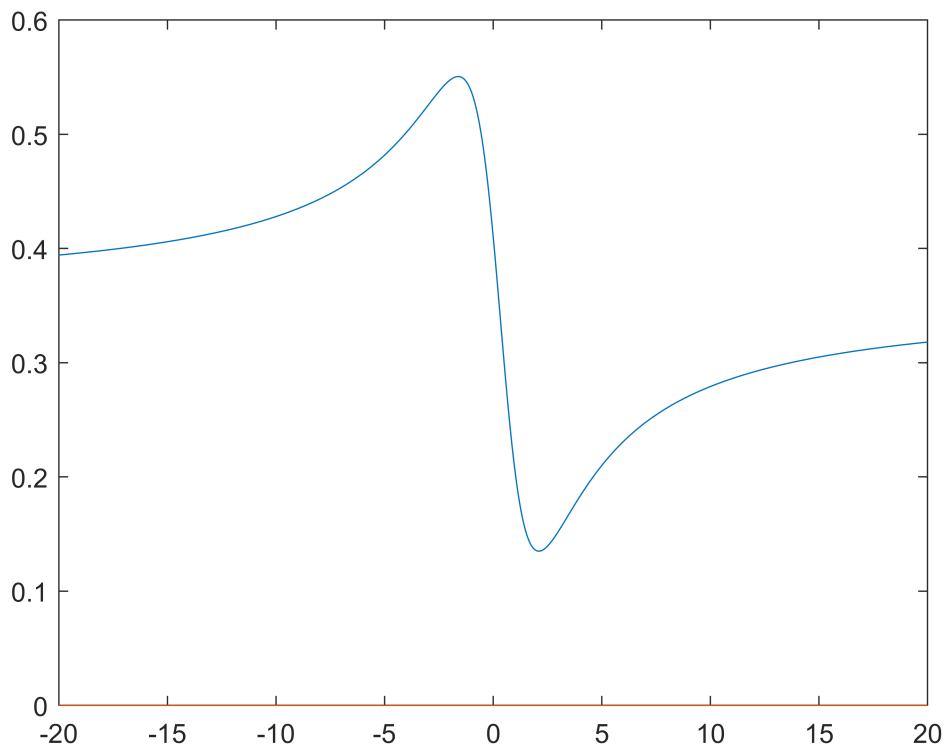
```
f3N = @(x) -1*(2+(x-1.45).^2)./(3+3.5*(.8*x.^2-.6.*x+2));
```

```
x = linspace(-20,20,1001);
```

```
zero = x.*0;
```

```
y = f3(x);
```

```
figure(); plot(x,y,x,zero);
```



```
% Apparent local minima at  $0 < x < 5$ , local maxima at  $-5 < x < 0$ .
```

```
disp(' The function has apperant maximum on interval  $-5 < x < 0$ ');
```

The function has apperant maximum on interval $-5 < x < 0$

```
disp(' and mimimum on interval  $0 < x < 5$ .');
```

and mimimum on interval $0 < x < 5$.

```
%find exact max/min with fmin
```

```
fmaxN5_0 = fminbnd(f3N,-5,0);
```

```
fmin0_5 = fminbnd(f3,0,5);
```

```
disp(' The function has local maximum at x = ',num2str(fmaxN5_0));
```

The function has local maximum at x = -1.6096

```
disp(' and local minimum at x = ',num2str(fmin0_5));
```

and local minimum at x = 2.1037

```
%%
```

```
%Question #4
disp('Question #4');
```

Question #4

```
%Part a
disp(' Part A');
```

Part A

```
fa = @(x) (x.^3.*exp(-.2.*x))./(1+x.^2);
intA = quadl(fa,1,11);
disp(' Integral from 1 to 11 is ',num2str(intA));
```

Integral from 1 to 11 is 14.7474

```
%Part b
disp(' Part B');
```

Part B

```
fb = @(x) (4.*x+3.*cos(4.*x))./(2+sin(x));
intB = quadl(fb,2,7);
disp(' Integral from 2 to 7 is ',num2str(intB));
```

Integral from 2 to 7 is 58.4444

```
%Part c
disp(' Part C');
```

Part C

```
fc = @(x) sqrt(1+.5.*x.^3-x.^2);
intC = quadl(fc,0,3);
disp(' Integral from 0 to 3 is ',num2str(intC));
```

Integral from 0 to 3 is 3.2382

```
%Part d
disp(' Part D');
```

Part D

```
fd = @(x) (2.*x.^2+x.*cos(x))./(exp(x));
intD = quadl(fd,0,8);
disp(' Integral from 0 to 8 is ',num2str(intD));
```

Integral from 0 to 8 is 3.9467

