Homework 5

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## 1.

d.

```
f = @(x) x.^2;
a = 0;
b = 1;
n = 5;
test1 = mpsum(f,[a,b],n)
```

```
test1 = 0.3300
```

```
test2 = trsum(f,[a,b],n)
```

```
test2 = 0.3400
```

```
test3 = sisum(f,[a,b],n)
```

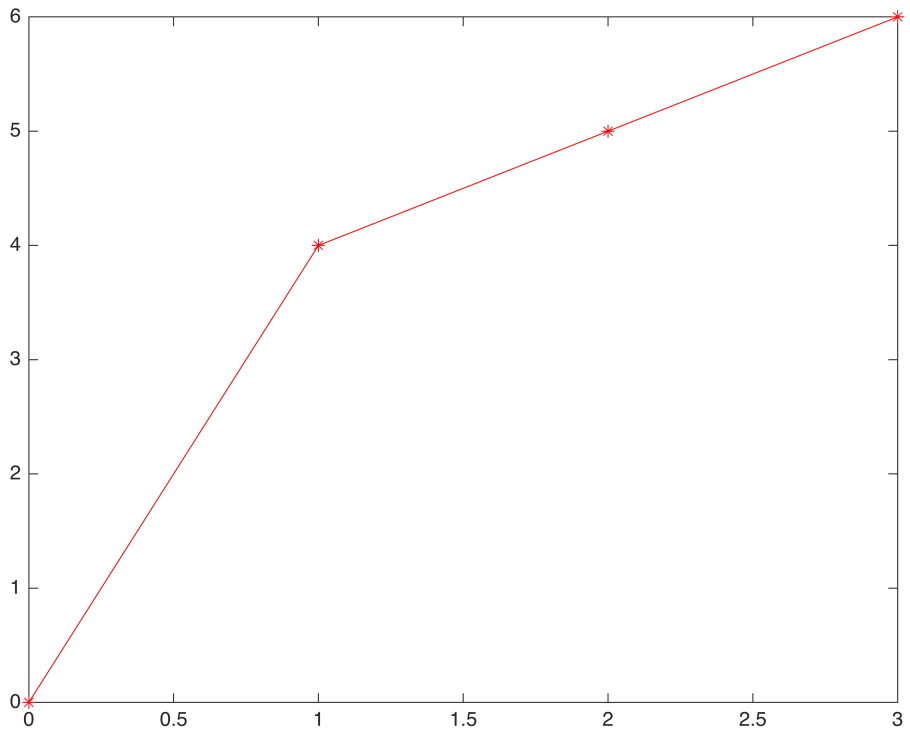
```
test3 = 0.3333
```

## 2.

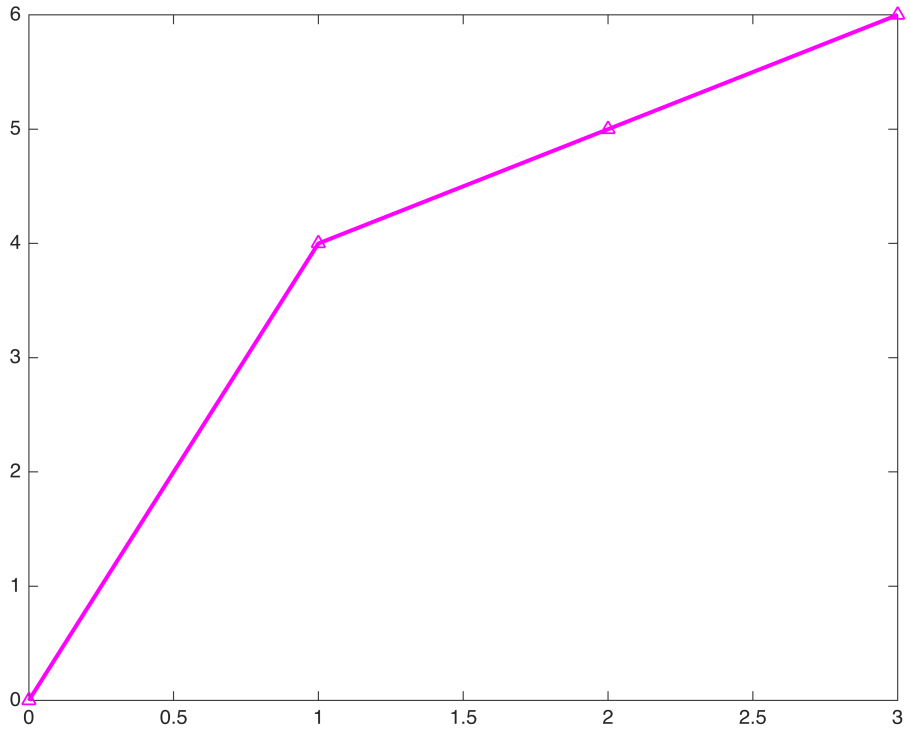
```
A = [1,2,3;4,5,6;7,8,9];
try
plotvec(A)
catch
disp("No good ")
end
```

```
No good
```

```
A = [1,2,3;4,5,6];
plotvec(A,' -*r')
```

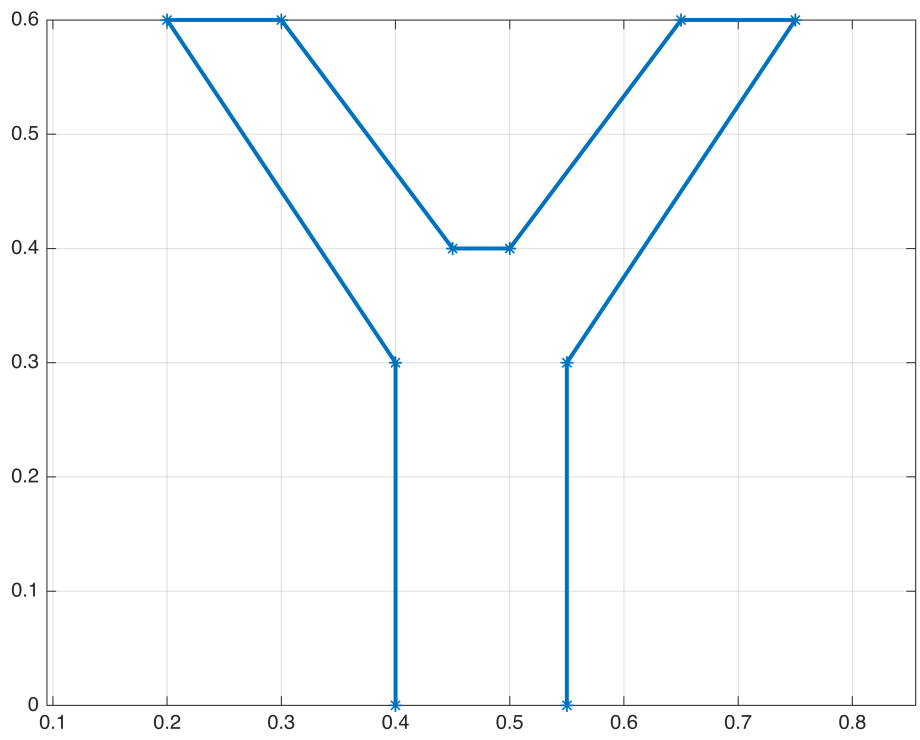



```
A = [1,2,3;4,5,6]';
plotvec(A,'-^m',LineWidth=2)
```



## 3.

```
[x,y] = let_Y();
```

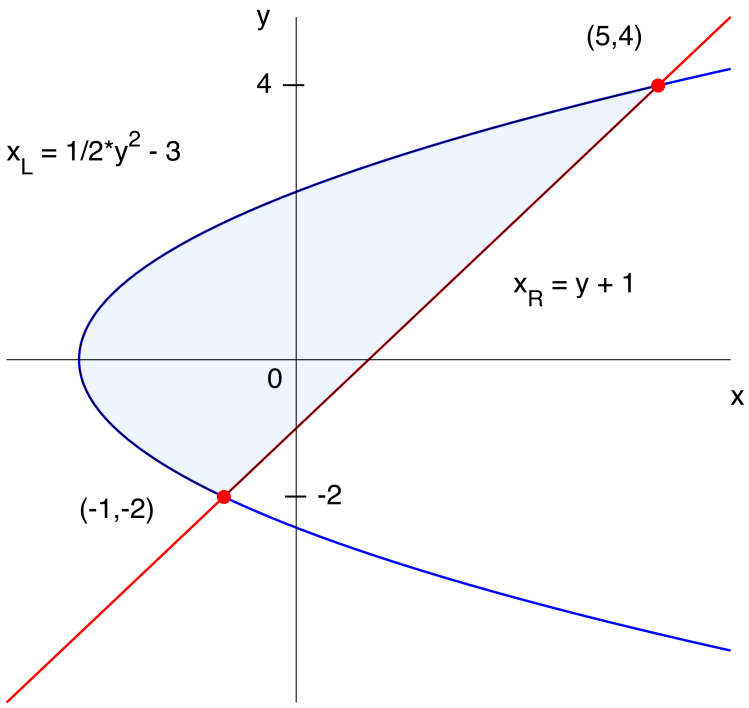



## 4.

a.

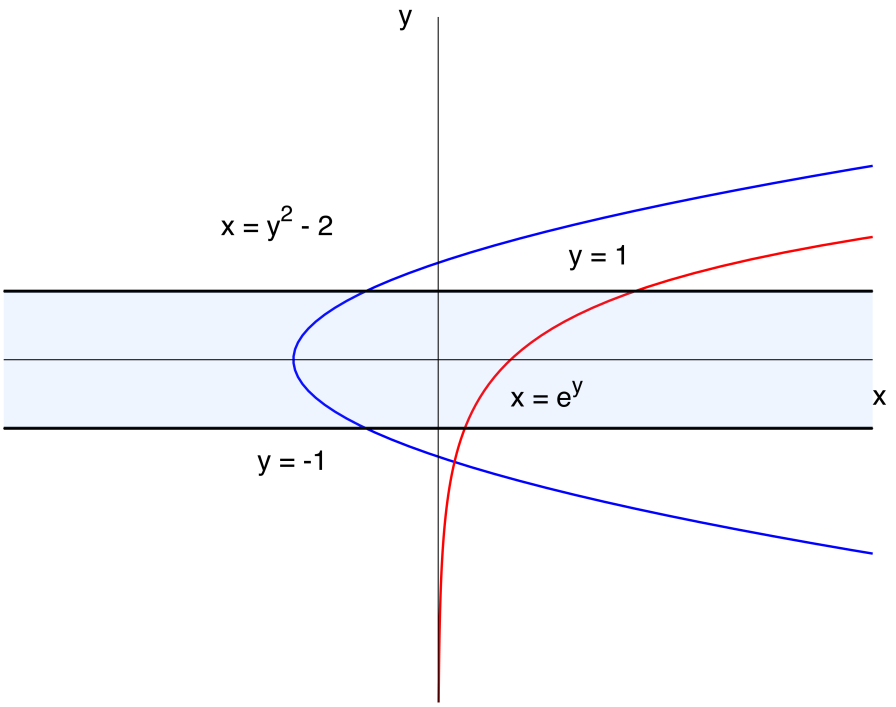
```
y=linspace(-5,5);
x1=(.5*y.^2)-3;
x2=y+1;
plot(x1,y,'b',x2,y,'r',LineWidth=1.2);
hold on
y=linspace(-2,4);
x1=(.5*y.^2)-3;
y1=y;
y=fliplr(y);
x2=y+1;
light_blue = [.4, 0.6, 1];
fill([x1,x2],[y1,y],light_blue,'FaceAlpha',.1);
x1point = -1;
y1point = -2;
scatter(x1point, y1point, 50, 'r', 'filled');
x2point = 5;
y2point = 4;
```

```
scatter(x2point, y2point, 50, 'r', 'filled')
line([0, 0], ylim, 'Color', 'k')
line(xlim, [0, 0], 'Color', 'k')
set(gca, 'Visible', 'off')
xlim([-6,6])
txt = 'x_L = 1/2*y^2 - 3';
text(-4,3,txt,'FontSize',14)
txt = 'x_R = y + 1';
text(3,1,txt,'FontSize',14)
txt = '(5,4)';
text(4,4.7,txt,'FontSize',14)
txt = '(-1,-2)';
text(-3,-2.2,txt,'FontSize',14)
txt = '- -2';
text(-.2,-2,txt,'FontSize',14)
txt = '4 -';
text(-.55,4,txt,'FontSize',14)
txt = '0';
text(-.4,-.3,txt,'FontSize',14)
txt = 'y';
text(-.55,5,txt,'FontSize',14)
txt = 'x';
text(6,-.55,txt,'FontSize',14)
hold off
```




b.

```
y=linspace(-5,5);
x1=(y.^2)-2;
x2= exp(y);
plot(x1,y,'b',x2,y,'r',LineWidth=1.2);
hold on
y=linspace(-2,4);
x1=(y.^2)-2;
y1=y;
y=fliplr(y);
x2=exp(y);
%fill([x1,x2],[y1,y],light_blue,'FaceAlpha',.1)
light_blue = [.4, 0.6, 1];
x = linspace(-10, 10);
yupper = ones(size(x));
ylower = -ones(size(x));
plot(x, yupper, 'k',LineWidth=1.5)
plot(x, ylower, 'k',LineWidth=1.5)
fill([x, fliplr(x)], [yupper, fliplr(ylower)], light_blue, 'FaceAlpha', 0.1)
line([0, 0], ylim, 'Color', 'k')
line(xlim, [0, 0], 'Color', 'k')
set(gca, 'Visible', 'off')
xlim([-6,6])
txt = 'x = y^2 - 2';
text(-3,2,txt,'FontSize',14)
txt = 'x = e^y';
text(1,-.5,txt,'FontSize',14)
txt = 'y = 1';
text(1.8,1.5,txt,'FontSize',14)
txt = 'y = -1';
text(-2.5,-1.5,txt,'FontSize',14)
txt = 'y';
text(-.55,5,txt,'FontSize',14)
txt = 'x';
text(6,-.55,txt,'FontSize',14)
hold off
```

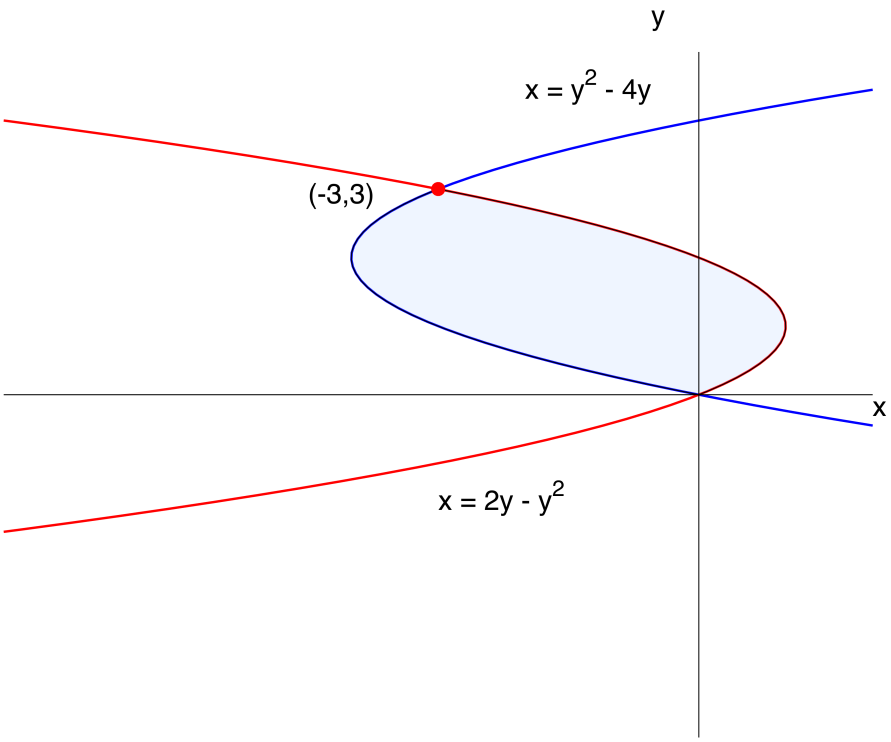



Couldn't figure out how to fill between the 4 different curves, only y = -1 and y = 1 and the other two curves separately. I commented out the code that fills between x = y^2 - 2 and x = e^y.

c.

```
y=linspace(-5,5);
x1=(y.^2)-4*y;
x2=2*y-(y.^2);
plot(x1,y,'b',x2,y,'r',LineWidth=1.2);
hold on
y=linspace(0,3);
x1=(y.^2)-4*y;
y1=y;
y=fliplr(y);
x2=2*y-(y.^2);
light_blue = [.4, 0.6, 1];
fill([x1,x2],[y1,y],light_blue,'FaceAlpha',.1);
x1point = -3;
y1point = 3;
scatter(x1point, y1point, 50, 'r', 'filled');
line([0, 0], ylim, 'Color', 'k')
line(xlim, [0, 0], 'Color', 'k')
set(gca, 'Visible', 'off')
xlim([-8,2])
txt = 'x = y^2 - 4y';
text(-2,4.5,txt,'FontSize',14)
```

```
txt = 'x = 2y - y^2';
text(-3,-1.5,txt,'FontSize',14)
txt = '(-3,3)';
text(-4.5,2.9,txt,'FontSize',14)
txt = 'y';
text(-.55,5.5,txt,'FontSize',14)
txt = 'x';
text(2,-.2,txt,'FontSize',14)
hold off
```




## 5.

```
syms x
coefficients = [-4 -3 4];
atoms = {@(x) x^2, @(x) x^3, @(x) sqrt(x), @(x) 1/x, @(x) sin(x), @(x)
exp(x), @(x) log(x)};
for i = 1:length(atoms)
    f = atoms{i};
    for j = 1:length(coefficients)
        c = coefficients(j);
        displayFormula (["'Given the function '" "c*f" "'.'"])
        deriv = c*diff (f,x) ;
        displayFormula (["'The derivative is '" " deriv " "'.'"])
    end
end
```

Given the function $-4\,x^2$.
The derivative is $-8\,x$.
Given the function $-3\,x^2$.
The derivative is $-6\,x$.
Given the function $4\,x^2$.
The derivative is $8\,x$.
Given the function $-4\,x^3$.
The derivative is $-12\,x^2$.
Given the function $-3\,x^3$.
The derivative is $-9\,x^2$.
Given the function $4\,x^3$.
The derivative is $12\,x^2$.
Given the function $-4\,\sqrt{x}$.
The derivative is $-\frac{2}{\sqrt{x}}$.
Given the function $-3\,\sqrt{x}$.
The derivative is $-\frac{3}{2\,\sqrt{x}}$.
Given the function $4\,\sqrt{x}$.
The derivative is $\frac{2}{\sqrt{x}}$.
Given the function $-\frac{4}{x}$.
The derivative is $\frac{4}{x^2}$.
Given the function $-\frac{3}{x}$.
The derivative is $\frac{3}{x^2}$.
Given the function $\frac{4}{x}$.
The derivative is $-\frac{4}{x^2}$.
Given the function $-4\sin(x)$.
The derivative is $-4\cos(x)$.
Given the function $-3\sin(x)$.
The derivative is $-3\cos(x)$.
Given the function $4\sin(x)$.
The derivative is $4\cos(x)$.

Given the function $-4\,e^x$.

The derivative is $-4\,e^x$.

Given the function $-3\,e^x$.

The derivative is $-3\,e^x$.

Given the function $4\,e^x$.

The derivative is $4\,e^x$.

Given the function $-4\log(x)$.

The derivative is $-\frac{4}{x}$.

Given the function $-3\log(x)$.

The derivative is $-\frac{3}{x}$.

Given the function $4\log(x)$.

The derivative is $\frac{4}{x}$.

1(a).

```
function y = mpsum(f,I,n)
a = I(1);
b = I(2);
Delta_x = (b-a)/n;
x = linspace(a+.5*Delta_x,b-.5*Delta_x,n);
y = sum(f(x))*Delta_x;
end
```

1(b).

```
function y = trsum(f,I,n)
a = I(1);
b = I(2);
Delta_x = (b-a)/n;
x = linspace(a,b,n+1);
y = (sum(f(x))-(f(a)+f(b))/2)*Delta_x;
end
```

1(c).

```
function y = sisum(f,I,n)
n = round(n/2)*2;
a = I(1);
b = I(2);
Delta_x = (b-a)/n;
x = linspace(a,b,n+1);
```

```
c = ones(1,n+1);
c(2:2:end-1) = 4;
c(3:2:end-2) = 2;
y = f(x)*c'*(Delta_x/3);
end
```

2(a).

```
function [] = plotvec(A,varargin)
    [m,n] = size(A);
    if ~(m==2|n==2)
        error('A must have 2 rows or 2 columns');
    end
    if n == 2
         x = [zeros(n,1)
             A(:,1)
             NaN(n,1)];
         y = [zeros(n,1)
             A(:,2)
             NaN(n,1)];
    elseif m==2
         x = [zeros(m,1)
             A(1,:)'
             NaN(m,1)];
         y = [zeros(m,1)
             A(2,:)'
             NaN(m,1)];
    end
    x=x(:);
    y=y(:);
    plot(x,y,varargin{:});
end
```

3.

```
function [x,y] = let_Y()
x = [.4 .4 .2 .3 .45 .5 .65 .75 .55 .55];
y = [0 .3 .6 .6 .4 .4 .6 .6 .3 0];
plot(x,y,'-*',LineWidth=2);
axis equal;
grid on;
end
```