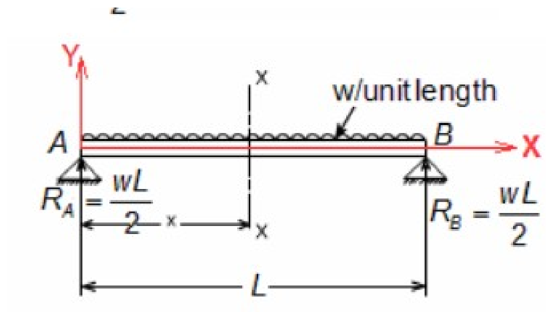
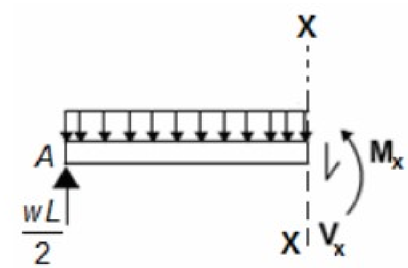




$$Recation\ force\ at\ A = R_A = \frac{wL}{2};$$

$$Recation\ force\ at\ B = R_B = \frac{wL}{2}$$

$$Consider\ only\ left\ side\ part\ of\ section\ \boldsymbol{X-X}$$

$$take\ moment\ with\ respect\ to\ section\ \boldsymbol{X-X}$$

$$M(x) = (R_A x) - (wx)\left(\frac{x}{2}\right) = (R_A x) - \left(\frac{wx^2}{2}\right) \qquad \boldsymbol{for\ \ 0 \le x \le L}$$

$$EI\frac{d^2y}{dx^2} = M(x)$$

$$slope(x) = \frac{dy}{dx} = \frac{1}{EI}\int M(x)$$

$$deflection(x) = y(x) = \frac{1}{EI}\iint M(x)$$

$$Conditions\ to\ evaluate\ contants\ during\ integration$$

$$at\ x = 0\,, y = 0\,; \quad at\ x = L, y = 0;$$

MATLAB code for simply supported beam with point load ‘W’ at a distance ‘a’ from extreme left side of beam

(a) To draw Shear Force, Bending Moment, slope and deflection diagrams

(b) To find out location of maximum deflection and its value

Input parameters:

E=Youngs Modulus or Modulus of elasticity in Pascals or N/m^2

I=Area moment of inertia in m^4

L=Length of beam in meters

w=Intensity of point load w in N/m

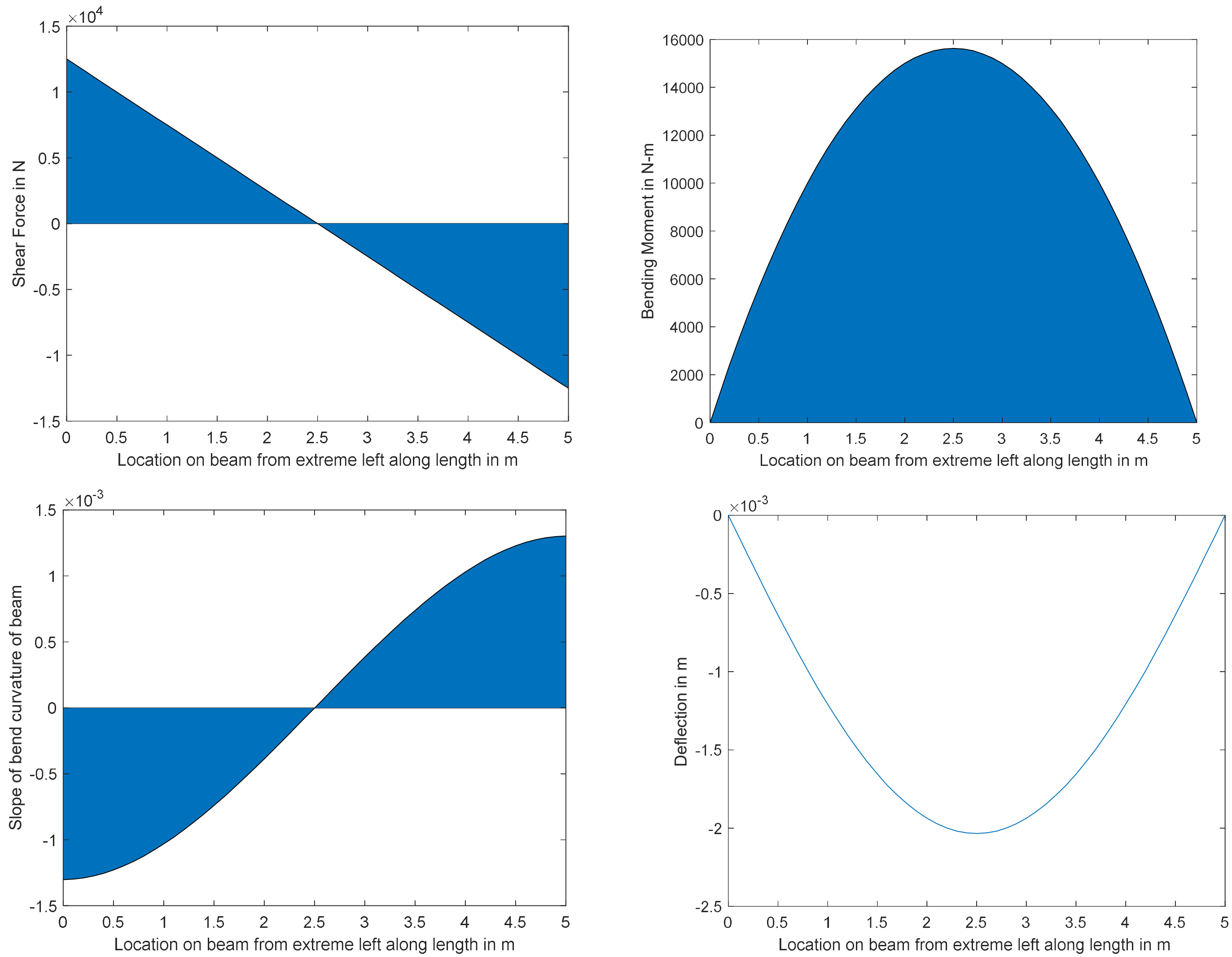
Example: `E=2*(10^11);I=10^(-4);w=5000;L=5;`

MATLAB code:

```
%simply supported beam with UDL
clear all;
clc;
E=input('Youngs Modulus or Modulus of elasticity in Pascals \n E=');
I=input('Area moment of inertia in m^4\n I=');
L=input('Length of beam in meters \n L=');
w=input('Intensity of point load w in N/m \n w=');
% Example E=2*(10^11),I=10^-4,w=5000 and L=5
Ra=(w*L/2);
Rb=(w*L)/2;
syms x M(x);
syms C1 C2 C3;
syms slope(x);
M(x)=(Ra*x)-((w*(x)^2)/2);
%first section
format long;
SF(x)=diff(M(x),x);
deflection(x,C2,C3)=((int(int(M(x),x),x))+(C2*x)+C3)/(E*I);
D1y(x,C2,C3)=diff(deflection,x);
eq2 =deflection(0,C2,C3) == 0;
```

```
eq3 =deflection(L,C2,C3) == 0;
[aa,bb]= vpasolve([eq2,eq3],[C2,C3]);
C2=eval(aa);
C3=eval(bb);
deflection(x)=deflection(x,C2,C3);
slope(x)=diff(deflection(x),x);
X=0:0.1:L;
figure
area(X,double(SF(X)))
ylabel('Shear Force in N');
xlabel('Location on beam from extreme left along length in m');
figure
area(X,double(M(X)))
ylabel('Bending Moment in N-m');
xlabel('Location on beam from extreme left along length in m');
figure
area(X,double(slope(X)))
ylabel('Slope of bend curvature of beam');
xlabel('Location on beam from extreme left along length in m');
figure
plot(X,double(deflection(X)))
ylabel('Deflection in m');
xlabel('Location on beam from extreme left along length in m');
% Maximum Bending Moment
BM_max_loc=vpasolve(diff(M(x),x)==0,x,[0,L]);
BM_max_loc=eval(BM_max_loc);
max_BM=double(M(BM_max_loc));
fprintf('Maximum BM is at %f m from extreme left side of beam \n',BM_max_loc);
fprintf('Maximum BM is %f N-m \n',max_BM);
% Maximum deflection
Def_max_loc=vpasolve(diff(deflection(x),x)==0,x,[0,L]);
Def_max_loc=eval(Def_max_loc);
max_def=double(deflection(Def_max_loc));
fprintf('Maximum deflection is at %f m from extreme left side of beam \n',Def_max_loc);
fprintf('Maximum deflection is %f m \n',max_def);
```

OUTPUT:




```
Maximum BM is at 2.500000 m from extreme left side of beam
Maximum BM is 15625.000000 N-m
Maximum deflection is at 2.500000 m from extreme left side of beam
Maximum deflection is -0.002035 m
```