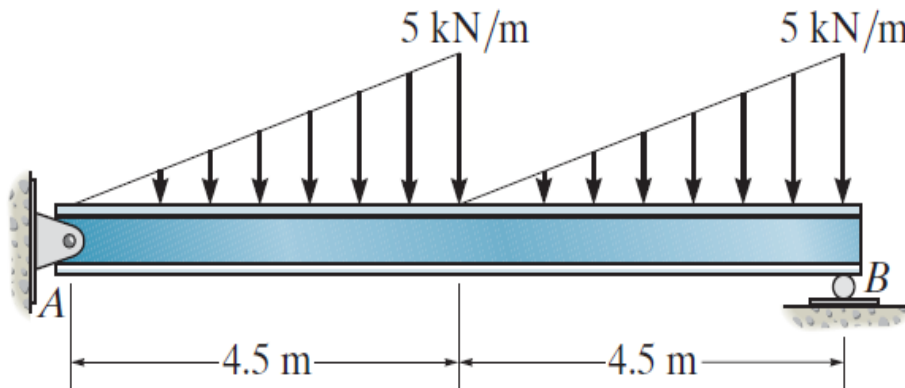


problem 6-29

- 6-29. Draw the shear and moment diagrams for the beam.



Prob. 6-29

beam

```
u = symunit;
x = sym('x');
E = sym('E');
I = sym('I');

old_assum = assumptions;
clearassum;
args = {'mode' 'factor'};
wf1 = findpoly(1, 'thru', [0 0], [4.5*u.m -5*u.kN/u.m], args{:});
wf2 = findpoly(1, 'thru', [4.5*u.m 0], [9*u.m -5*u.kN/u.m], args{:});

b = beam; %(kN,m)
b = b.add('reaction', 'force', 'Ra', 0);
b = b.add('reaction', 'force', 'Rb', 9*u.m);
b = b.add('distributed', 'force', wf1, [0 4.5]*u.m);
b = b.add('distributed', 'force', wf2, [4.5 9]*u.m, [false true]);
b.L = 9*u.m;
```

elastic curve

```
[y(x,E,I) dy(x,E,I) m v w r] = b.elastic_curve(x, 'factor'); %#ok
y
```

$$y(x, E, I) =$$

$$\begin{cases} -\frac{x (32 x^4 - 5400 x^2 m^2 + 260253 m^4)}{3456 E I} \frac{kN}{m^2} & \text{if } x \leq \frac{9}{2} m \\ -\frac{(x - 9 m) (32 x^4 - 432 x^3 m + 3672 x^2 m^2 - 54432 x m^3 + 32805 m^4)}{3456 E I} \frac{kN}{m^2} & \text{if } \frac{9}{2} m < x \end{cases}$$

dy

$$dy(x, E, I) =$$

$$\begin{cases} -\frac{160 x^4 - 16200 x^2 m^2 + 260253 m^4}{3456 E I} \frac{kN}{m^2} & \text{if } x \leq \frac{9}{2} m \\ -\frac{160 x^4 - 2880 x^3 m + 22680 x^2 m^2 - 174960 x m^3 + 522693 m^4}{3456 E I} \frac{kN}{m^2} & \text{if } \frac{9}{2} m < x \end{cases}$$

m

$$m(x) =$$

$$\begin{cases} \frac{5 x (405 m^2 - 8 x^2)}{216} \frac{kN}{m^2} & \text{if } x \leq \frac{9}{2} m \\ -\frac{5 (x - 9 m) (8 x^2 - 36 x m + 243 m^2)}{216} \frac{kN}{m^2} & \text{if } \frac{9}{2} m < x \end{cases}$$

v

$$v(x) =$$

$$\begin{cases} \frac{5 (135 m^2 - 8 x^2)}{72} \frac{kN}{m^2} & \text{if } x \leq \frac{9}{2} m \\ -\frac{5 (8 x^2 - 72 x m + 189 m^2)}{72} \frac{kN}{m^2} & \text{if } \frac{9}{2} m < x \end{cases}$$

w

$$w(x) =$$

$$\begin{cases} -\frac{10 x}{9} \frac{kN}{m^2} & \text{if } x \leq \frac{9}{2} m \\ -\frac{5 (2 x - 9 m)}{9} \frac{kN}{m^2} & \text{if } \frac{9}{2} m < x \end{cases}$$

reactions

$$Ra = \text{vpa}(r.Ra, 3) \% \#ok$$

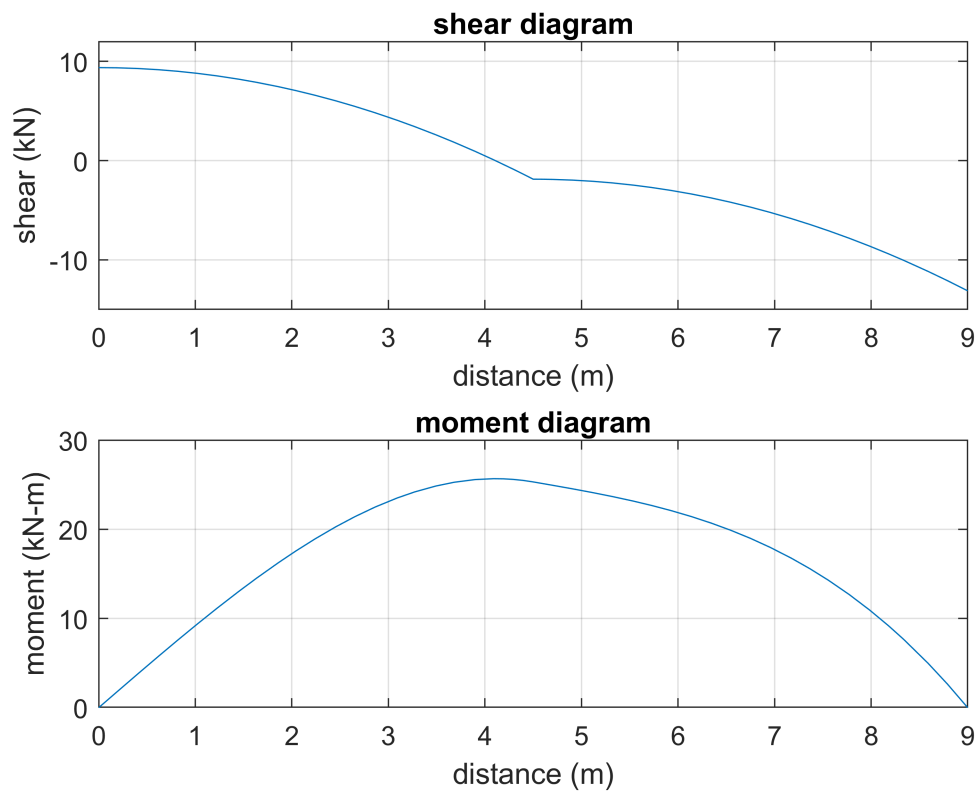
$$Ra = 9.38 \text{ kN}$$

```
Rb = vpa(r.Rb, 4) %#ok
```

```
Rb = 13.12 kN
```

shear and bending moment diagrams

```
beam.shear_moment(m, v, [0 9], {'kN' 'm'});  
subplot(2,1,1);  
axis([0 9 -15 12]);  
subplot(2,1,2);  
axis([0 9 0 30]);
```



clean up

```
setassum(old_assum);  
clear args old_assum Ra Rb;
```