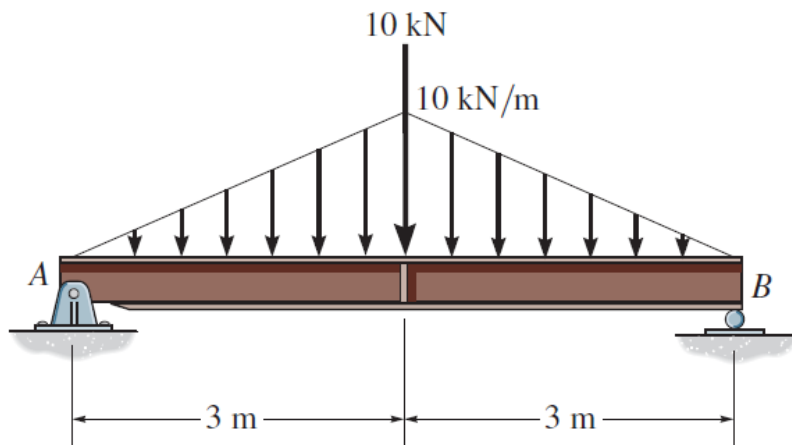


## problem 6-20

**\*6–20.** Draw the shear and moment diagrams for the simply supported beam.



**Prob. 6–20**

**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], [3*u.m -10*u.kN/u.m], args{:});
wf2 = findpoly(1, 'thru', [3*u.m -10*u.kN/u.m], [6*u.m 0], args{:});

b = beam; %(kN,m)
b = b.add('reaction', 'force', 'Ra', 0);
b = b.add('reaction', 'force', 'Rb', 6*u.m);
b = b.add('applied', 'force', -10*u.kN, 3*u.m);
b = b.add('distributed', 'force', wf1, [0 3]*u.m);
b = b.add('distributed', 'force', wf2, [3 6]*u.m, [false true]);
b.L = 6*u.m;
```

**elastic curve**

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

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

$$\begin{cases} -\frac{x (x^4 - 120 x^2 m^2 + 2835 m^4)}{36 E I} \frac{kN}{m^2} & \text{if } x \leq 3 m \\ \frac{(x - 6 m) (x^4 - 24 x^3 m + 96 x^2 m^2 + 576 x m^3 - 189 m^4)}{36 E I} \frac{kN}{m^2} & \text{if } 3 m < x \end{cases}$$

dy

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

$$\begin{cases} \frac{5 (x - 3 m) (x + 3 m) (63 m^2 - x^2)}{36 E I} \frac{kN}{m^2} & \text{if } x \leq 3 m \\ -\frac{5 (x - 3 m) (x - 9 m) (-x^2 + 12 x m + 27 m^2)}{36 E I} \frac{kN}{m^2} & \text{if } 3 m < x \end{cases}$$

m

$$m(x) =$$

$$\begin{cases} -\frac{5 x (x - 6 m) (x + 6 m)}{9} \frac{kN}{m^2} & \text{if } x \leq 3 m \\ \frac{5 x (x - 6 m) (x - 12 m)}{9} \frac{kN}{m^2} & \text{if } 3 m < x \end{cases}$$

v

$$v(x) =$$

$$\begin{cases} \frac{5 (12 m^2 - x^2)}{3} \frac{kN}{m^2} & \text{if } x \leq 3 m \\ \frac{5 (x^2 - 12 x m + 24 m^2)}{3} \frac{kN}{m^2} & \text{if } 3 m < x \end{cases}$$

w

$$w(x) =$$

$$\begin{cases} -\frac{10 x}{3} \frac{kN}{m^2} & \text{if } x \leq 3 m \\ \frac{10 (x - 6 m)}{3} \frac{kN}{m^2} & \text{if } 3 m < x \end{cases}$$

reactions

$$R_a = r.R_a \text{ \%#ok}$$

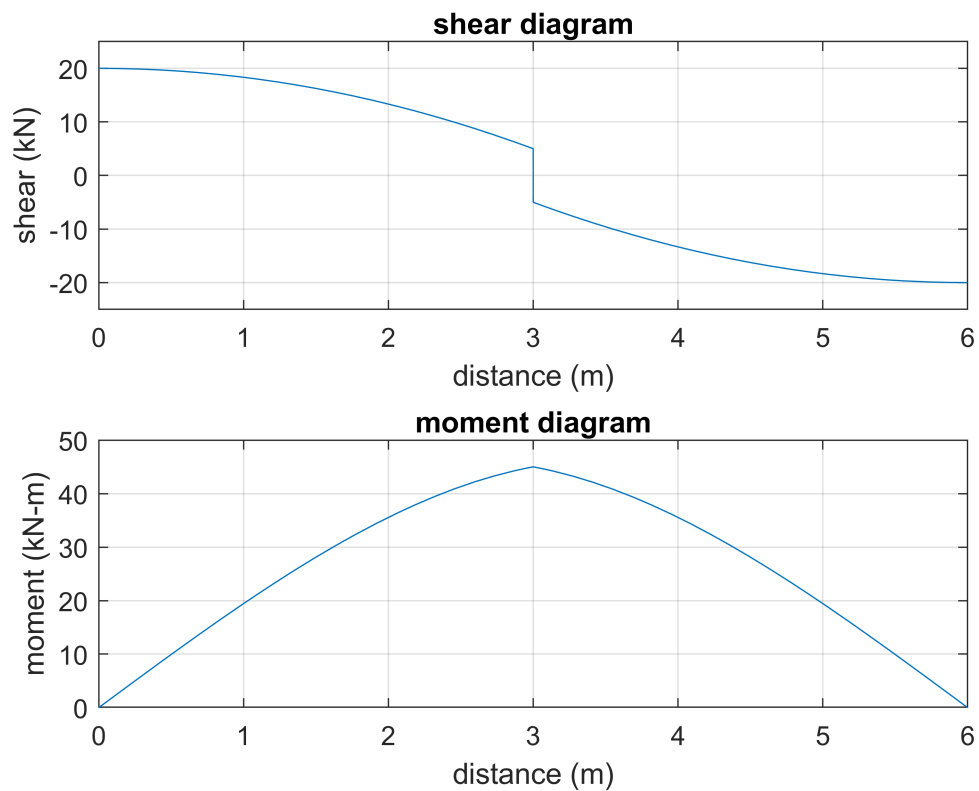
$$R_a = 20 kN$$

```
Rb = r.Rb %#ok
```

```
Rb = 20 kN
```

## shear and moment diagrams

```
beam.shear_moment(m, v, [0 6], {'kN' 'm'});  
subplot(2,1,1);  
axis([0 6 -25 25]);  
subplot(2,1,2);  
axis([0 6 0 50]);
```



## clean up

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