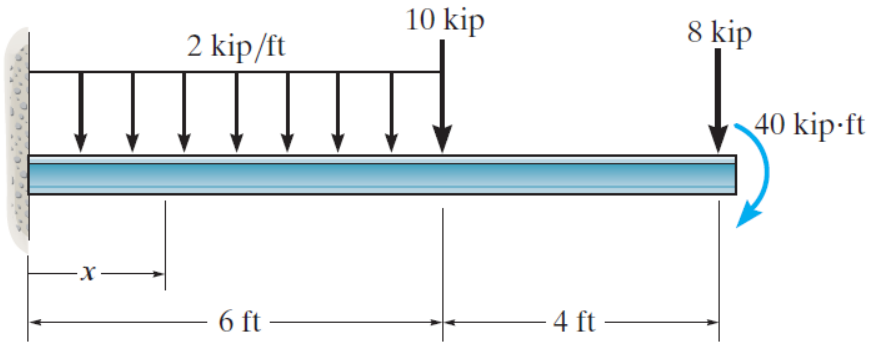
problem 6-18

6–18. Draw the shear and moment diagrams for the beam, and determine the shear and moment throughout the beam as functions of x.



Prob. 6–18

beam

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

old_assum = assumptions;
clearassum;

b = beam; %(kip,ft)
b = b.add('reaction', 'force', 'R', 0);
b = b.add('reaction', 'moment', 'M', 0);
b = b.add('distributed', 'force', -2*u.kip/u.ft, [0 6]*u.ft);
b = b.add('applied', 'force', -10*u.kip, 6*u.ft);
b = b.add('applied', 'force', -8*u.kip, 10*u.ft);
b = b.add('applied', 'moment', -40*u.kip*u.ft, 10*u.ft);
b.L = 10*u.ft;
```

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) =
```

$$\begin{cases} -\dfrac{x^2\ (x^2 - 60\,x\,\text{ft} + 1296\,\text{ft}^2)}{12\,E\,I}\ \dfrac{\text{kip}}{\text{ft}} & \text{if } x \le 6\,\text{ft} \\ -\dfrac{4\ (-x^3 + 45\,x^2\,\text{ft} + 189\,x\,\text{ft}^2 - 351\,\text{ft}^3)}{3\,E\,I}\ \text{kip} & \text{if } 6\,\text{ft} < x \end{cases}$$

```
dy
```

dy(x, E, I) =

$$\begin{cases} -\dfrac{x\ (x^2 - 45\,x\,\text{ft} + 648\,\text{ft}^2)}{3\,E\,I}\ \dfrac{\text{kip}}{\text{ft}} & \text{if } x \le 6\,\text{ft} \\ -\dfrac{4\ (-x^2 + 30\,x\,\text{ft} + 63\,\text{ft}^2)}{E\,I}\ \text{kip} & \text{if } 6\,\text{ft} < x \end{cases}$$

```
m
```

m(x) =

$$\begin{cases} -(x - 12\,\text{ft})\ (x - 18\,\text{ft})\ \dfrac{\text{kip}}{\text{ft}} & \text{if } x \le 6\,\text{ft} \\ 8\ (x - 15\,\text{ft})\ \text{kip} & \text{if } 6\,\text{ft} < x \end{cases}$$

```
v
```

v(x) =

$$\begin{cases} -2\ (x - 15\,\text{ft})\ \dfrac{\text{kip}}{\text{ft}} & \text{if } x \le 6\,\text{ft} \\ 8\,\text{kip} & \text{if } 6\,\text{ft} < x \end{cases}$$

```
w
```

w(x) =

$$\begin{cases} -2\ \dfrac{\text{kip}}{\text{ft}} & \text{if } x \le 6\,\text{ft} \\ 0 & \text{if } 6\,\text{ft} < x \end{cases}$$

reactions

```
R = r.R %#ok
```

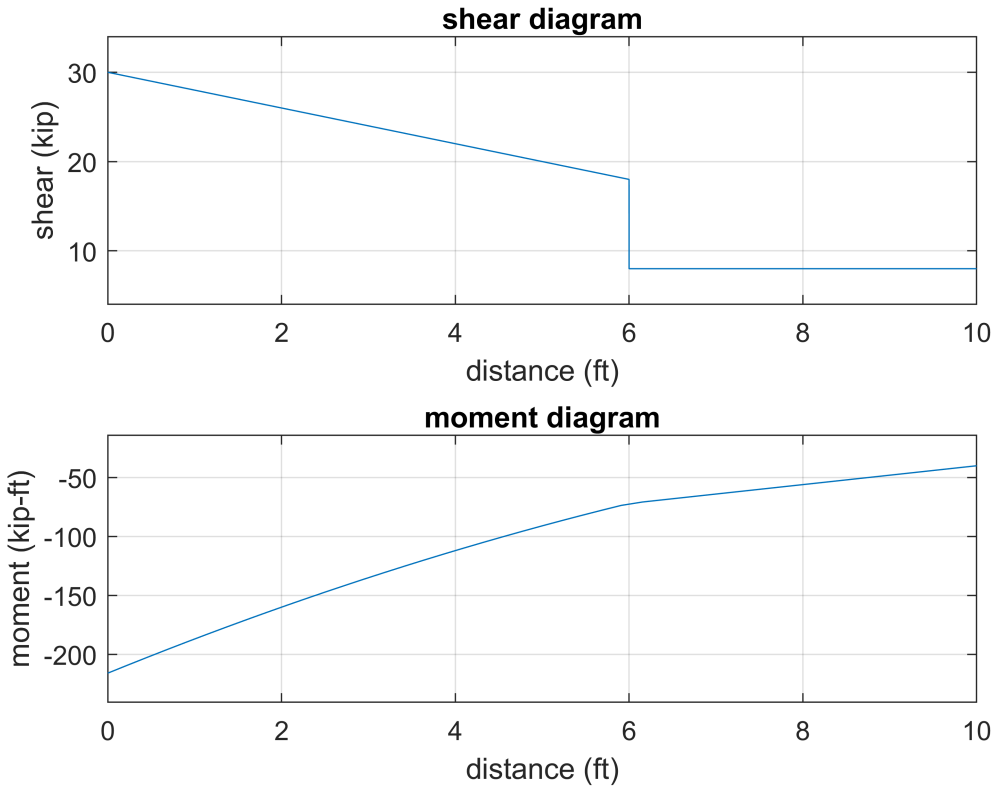
R = 30 kip

```
M = r.M %#ok
```

M = 216 ft kip

shear and moment diagrams

```
beam.shear_moment(m, v, [0 10], {'kip' 'ft'});
subplot(2,1,1);
axis([0 10 4 34]);
subplot(2,1,2);
axis([0 10 -241 -14]);
```



clean up

```
setassum(old_assum);
clear old_assum R M;
```