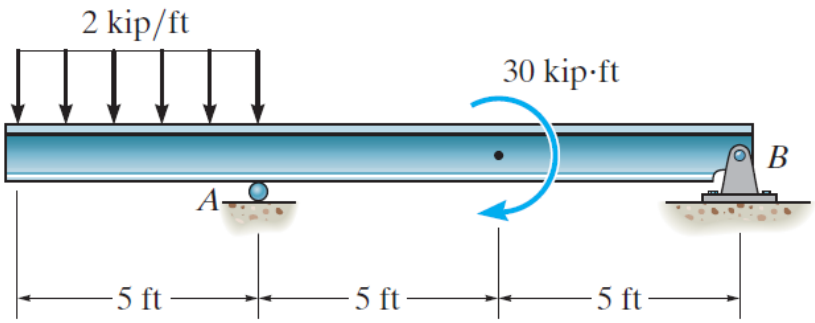
problem 6-19

6–19. Draw the shear and moment diagrams for the beam.



Prob. 6–19

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', 'Ra', 5*u.ft);
b = b.add('reaction', 'force', 'Rb', 15*u.ft);
b = b.add('distributed', 'force', -2*u.kip/u.ft, [0 5]*u.ft);
b = b.add('applied', 'moment', -30*u.kip*u.ft, 10*u.ft);
b.L = 15*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) =

$$\begin{cases} -\dfrac{(x-5\,\text{ft})\,(x^3+5\,x^2\,\text{ft}+25\,x\,\text{ft}^2-1525\,\text{ft}^3)}{12\,E\,I}\,\dfrac{\text{kip}}{\text{ft}} & \text{if } x \le 5\,\text{ft} \\ -\dfrac{(x-5\,\text{ft})\,(x^2+140\,x\,\text{ft}-1875\,\text{ft}^2)}{12\,E\,I}\,\text{kip} & \text{if } x \in (5\,\text{ft}, 10\,\text{ft}] \\ -\dfrac{(x-15\,\text{ft})\,(x^2-30\,x\,\text{ft}+575\,\text{ft}^2)}{12\,E\,I}\,\text{kip} & \text{if } 10\,\text{ft} < x \end{cases}$$

```
dy
```

dy(x, E, I) =

$$\begin{cases} \frac{825\,\text{ft}^3 - 2\,x^3}{6\,\text{E}\,\text{I}}\ \frac{\text{kip}}{\text{ft}} & \text{if } x \le 5\,\text{ft} \\ -\frac{3\,x^2 + 270\,x\,\text{ft} - 2575\,\text{ft}^2}{12\,\text{E}\,\text{I}}\ \text{kip} & \text{if } x \in (5\,\text{ft}, 10\,\text{ft}] \\ -\frac{3\,x^2 - 90\,x\,\text{ft} + 1025\,\text{ft}^2}{12\,\text{E}\,\text{I}}\ \text{kip} & \text{if } 10\,\text{ft} < x \end{cases}$$

```
m
```

m(x) =

$$\begin{cases} -x^2\ \frac{\text{kip}}{\text{ft}} & \text{if } x \le 5\,\text{ft} \\ -\frac{x + 45\,\text{ft}}{2}\ \text{kip} & \text{if } x \in (5\,\text{ft}, 10\,\text{ft}] \\ -\frac{x - 15\,\text{ft}}{2}\ \text{kip} & \text{if } 10\,\text{ft} < x \end{cases}$$

```
v
```

v(x) =

$$\begin{cases} -2\,x\ \frac{\text{kip}}{\text{ft}} & \text{if } x \le 5\,\text{ft} \\ -\frac{1}{2}\ \text{kip} & \text{if } 5\,\text{ft} < x \end{cases}$$

```
w
```

w(x) =

$$\begin{cases} -2\ \frac{\text{kip}}{\text{ft}} & \text{if } x \le 5\,\text{ft} \\ 0 & \text{if } 5\,\text{ft} < x \end{cases}$$

reactions

```
Ra = vpa(r.Ra) %#ok
```

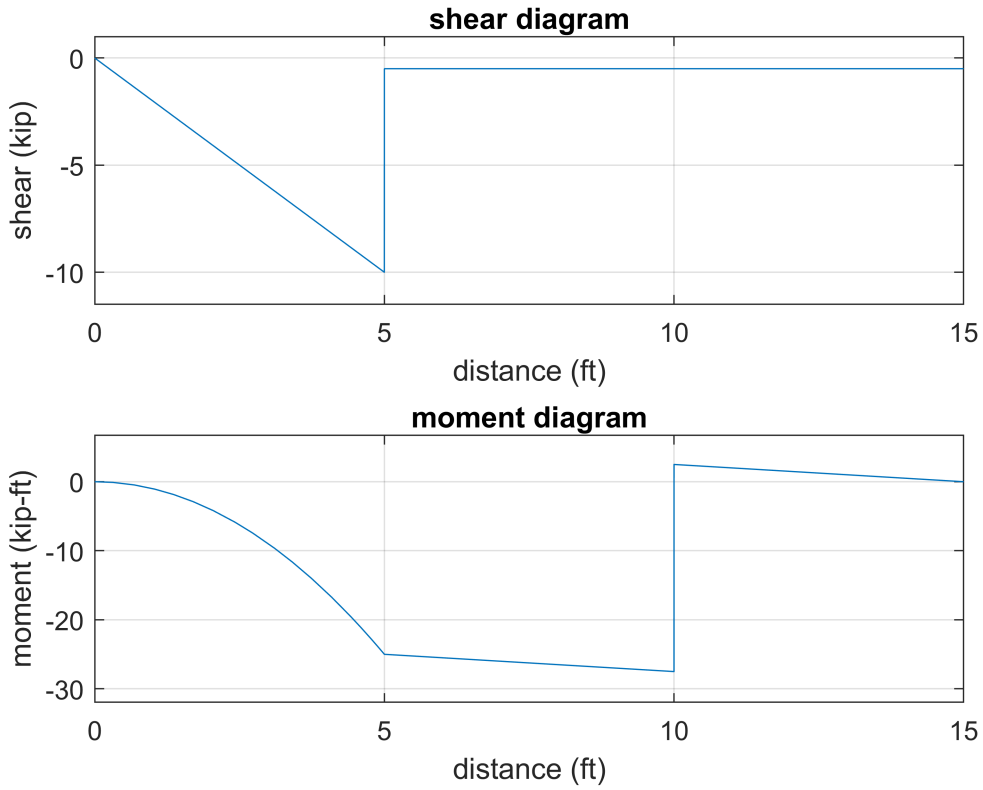
Ra = 9.5 kip

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

Rb = 0.5 kip

shear and moment diagrams

```
beam.shear_moment(m, v, [0 15], {'kip' 'ft'});
subplot(2,1,1);
axis([0 15 -11.5 1]);
subplot(2,1,2);
axis([0 15 -32 6.75]);
```



clean up

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