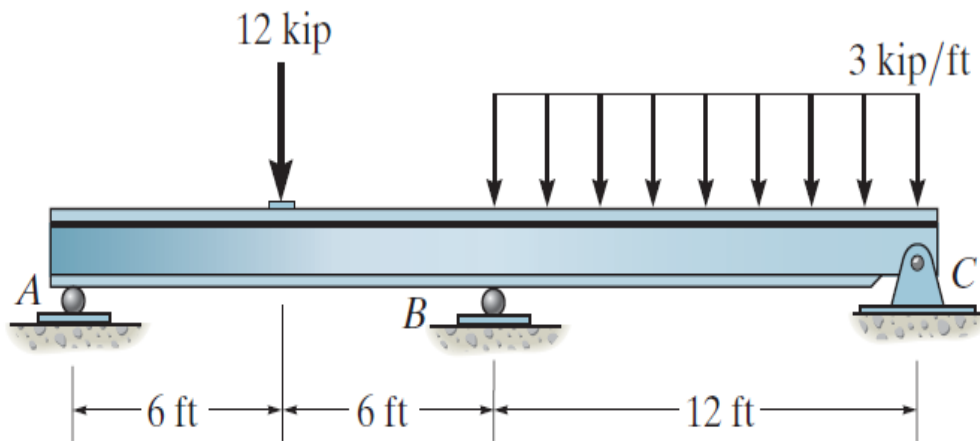


problem 12-123

12-123. Determine the reactions at the supports A , B , and C , then draw the shear and moment diagrams. EI is constant.



Prob. 12-123

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', 0);
b = b.add('reaction', 'force', 'Rb', 12*u.ft);
b = b.add('reaction', 'force', 'Rc', 24*u.ft);
b = b.add('applied', 'force', -12*u.kip, 6*u.ft);
b = b.add('distributed', 'force', -3*u.kip/u.ft, [12 24]*u.ft);
b.L = 24*u.ft;
```

elastic curve

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

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

$$\begin{cases} -\frac{x(432 \text{ ft}^2 - 7x^2)}{16EI} \text{ kip} & \text{if } x \leq 6 \text{ ft} \\ -\frac{(x-12 \text{ ft})(25x^2 - 276x \text{ ft} + 576 \text{ ft}^2)}{16EI} \text{ kip} & \text{if } x \in (6 \text{ ft}, 12 \text{ ft}] \\ -\frac{(x-12 \text{ ft})(x-24 \text{ ft})(2x^2 - 81x \text{ ft} + 612 \text{ ft}^2)}{16EI} \frac{\text{kip}}{\text{ft}} & \text{if } 12 \text{ ft} < x \end{cases}$$

dy

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

$$\begin{cases} -\frac{3(144 \text{ ft}^2 - 7x^2)}{16EI} \text{ kip} & \text{if } x \leq 6 \text{ ft} \\ -\frac{3(25x^2 - 384x \text{ ft} + 1296 \text{ ft}^2)}{16EI} \text{ kip} & \text{if } x \in (6 \text{ ft}, 12 \text{ ft}] \\ -\frac{8x^3 - 459x^2 \text{ ft} + 8208x \text{ ft}^2 - 45360 \text{ ft}^3}{16EI} \frac{\text{kip}}{\text{ft}} & \text{if } 12 \text{ ft} < x \end{cases}$$

m

$$m(x) =$$

$$\begin{cases} \frac{21x}{8} \text{ kip} & \text{if } x \leq 6 \text{ ft} \\ -\frac{3(25x - 192 \text{ ft})}{8} \text{ kip} & \text{if } x \in (6 \text{ ft}, 12 \text{ ft}] \\ -\frac{3(x-24 \text{ ft})(4x-57 \text{ ft})}{8} \frac{\text{kip}}{\text{ft}} & \text{if } 12 \text{ ft} < x \end{cases}$$

v

$$v(x) =$$

$$\begin{cases} \frac{21}{8} \text{ kip} & \text{if } x \leq 6 \text{ ft} \\ -\frac{75}{8} \text{ kip} & \text{if } x \in (6 \text{ ft}, 12 \text{ ft}] \\ -\frac{3(8x - 153 \text{ ft})}{8} \frac{\text{kip}}{\text{ft}} & \text{if } 12 \text{ ft} < x \end{cases}$$

w

$$w(x) =$$

$$\begin{cases} 0 & \text{if } x < 12 \text{ ft} \\ -3 \frac{\text{kip}}{\text{ft}} & \text{if } 12 \text{ ft} \leq x \end{cases}$$

reactions

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

```
Ra = 2.625 kip
```

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

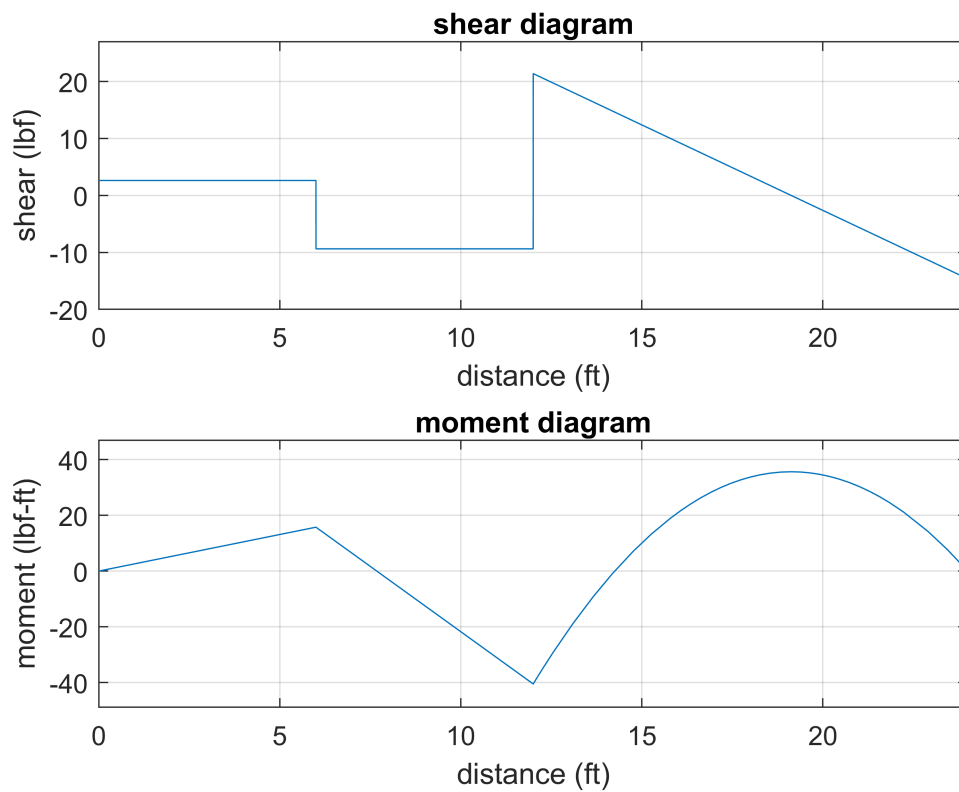
```
Rb = 30.75 kip
```

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

```
Rc = 14.625 kip
```

shear and moment diagram

```
beam.shear_moment(m, v, [0 24], {'lbf' 'ft'});  
subplot(2,1,1);  
axis([0 24 -20 27]);  
subplot(2,1,2);  
axis([0 24 -49 47]);
```



clean up

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