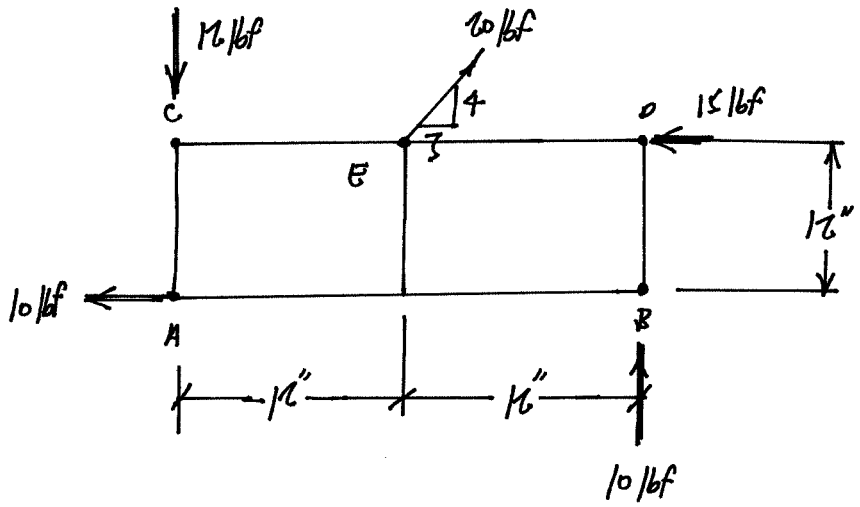
28 April 2010



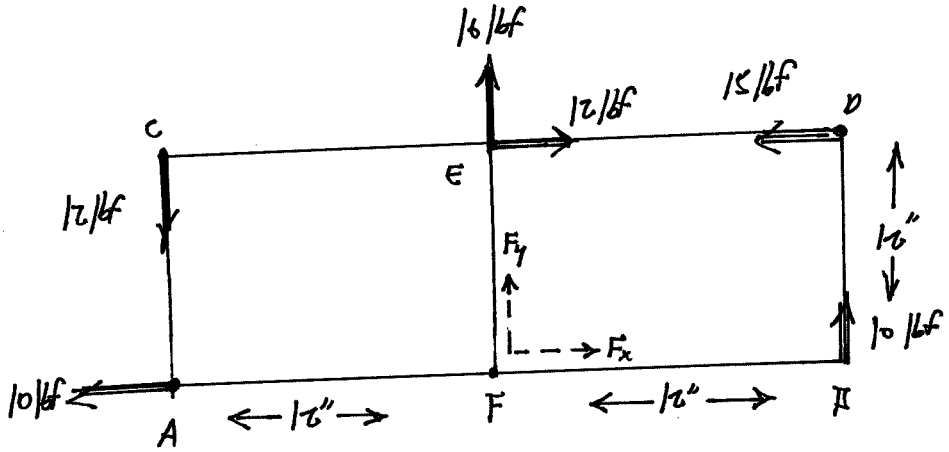
problem: compute the magnitude & direction for the force necessary to hold the rigid body in equilibrium. also specify location.

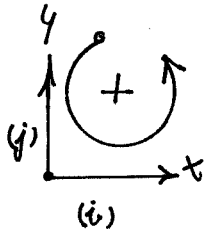
solution: resolve the 20 lbf force into components horizontal and vertical.

$m\angle\theta = \tan^{-1}\left(\frac{4}{3}\right) = 53.130^\circ \Rightarrow$ at pt E, $E_x = 12$ lbf $\rightarrow$, $E_y = 16$ lbf.

check: $E = \sqrt{E_x + E_y} = \sqrt{12^2 + 16^2}$ lbf $\equiv$ 20 lbf.

$$m\angle\theta = \tan^{-1}\left(\frac{16\ \text{lbf}}{12\ \text{lbf}}\right) = 53.130^\circ$$





- there is no specified location to place the load and direction of action; the choice is up to the reader!
- arbitrarily select pt F and compute the necessary unknown force to hold the rigid body in place.

location	$F_x(\rightarrow)$	$F_y(\uparrow)$
pt A	-10	0
pt B	0	$+10$
pt C	0	-12
pt D	-15	0
pt E	$+12$	$+16$
pt F	F_x	F_y
	$\rightarrow \sum_1 F_x$	$\uparrow \sum_1 F_y$

$$\rightarrow \sum_1 F_x = F_x - 13 \equiv 0 \Rightarrow F_x = 13 \text{ lbf } (\rightarrow)$$
$$\uparrow \sum_1 F_y = F_y + 14 \equiv 0 \Rightarrow F_y = 14 \text{ lbf } (\downarrow)$$

$\Big\}$ $F = 19.1 \text{ lbf} \angle 47.1^\circ$ ↘

- so at pt F, this is the magnitude of the force <u>OF ALL IMPOSED SOURCES.</u>
- to keep the body in equilibrium, negate the vectors; i.e. multiply by -1.

$$\therefore \quad R = -13\hat{i} + 14\hat{j} \Rightarrow F_x = 13 \text{ lbf } (\leftarrow), \; F_y = 14 \text{ lbf } (\uparrow)$$