

Questions?

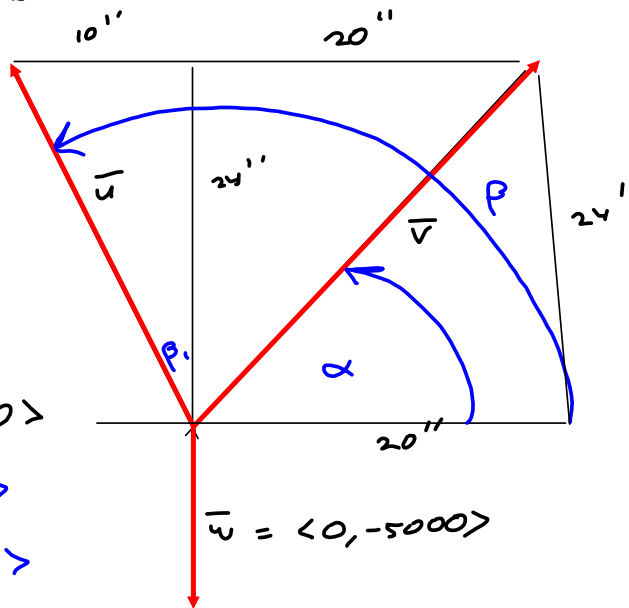
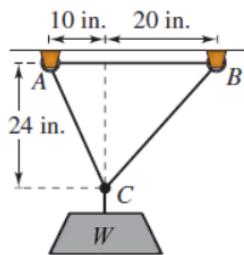
3.3 Apps #s 2, 3

Use the figure to determine the tension in each cable supporting the load. (Round your answers to one decimal point.)

$W = 5000$ lb

tension in \overline{AC} \times lb

tension in \overline{BC} \times lb



$$\vec{u} + \vec{v} = \langle 0, +5000 \rangle$$

$$\vec{u} = \|\vec{u}\| \langle \cos \beta, \sin \beta \rangle$$

$$\vec{v} = \|\vec{v}\| \langle \cos \alpha, \sin \alpha \rangle$$

$$\beta = 90^\circ + \arctan\left(\frac{10}{24}\right)$$

$$\beta = 90^\circ + \arctan\left(\frac{5}{12}\right)$$

$$\alpha = \arctan\left(\frac{24}{20}\right) = \arctan\left(\frac{6}{5}\right)$$

$$\vec{u} + \vec{v} = -\vec{w}$$

$$\|\vec{u}\| \langle \cos \beta, \sin \beta \rangle + \|\vec{v}\| \langle \cos \alpha, \sin \alpha \rangle = \langle 0, 5,000 \rangle$$

$$\text{Let } x = \|\vec{u}\|, y = \|\vec{v}\|$$

$$(\cos \beta)x + (\cos \alpha)y = 0$$

$$(\sin \beta)x + (\sin \alpha)y = 5000$$

$$a = \cos \beta, b = \cos \alpha, c = \sin \beta, d = \sin \alpha$$

$$\begin{aligned} ax + by &= 0 & \rightarrow by &= -ax \rightarrow \\ cx + dy &= 5000 & y &= -\frac{ax}{b} \end{aligned}$$

$$cx + d\left(-\frac{a}{b}x\right) = 5000$$

$$cx - \frac{ad}{b}x = 5000$$

$$\left(c - \frac{ad}{b}\right)x = 5000$$

$$x = \frac{5000}{c - \frac{ad}{b}} = \frac{5000}{\sin\beta - \frac{\cos\beta \sin\alpha}{\cos\alpha}} = \frac{5000}{\sin\beta - \tan\alpha \cos\beta}$$

$$= \frac{5000}{\sin(90^\circ + \arctan(\frac{5}{12})) - \cos(90^\circ + \arctan(\frac{5}{12})) \tan(\arctan(\frac{6}{5}))}$$

$$\frac{5000}{\sin(90^\circ + \arctan(\frac{5}{12})) - \frac{6}{5}\cos(90^\circ + \arctan(\frac{5}{12}))} \approx 3611.1111$$

$$a = \cos\beta, \quad b = \cos\alpha, \quad c = \sin\beta, \quad d = \sin\alpha$$

$$\beta = 90^\circ + \arctan\left(\frac{5}{12}\right)$$

$$\alpha = \arctan\left(\frac{24}{20}\right) = \arctan\left(\frac{6}{5}\right)$$

$$y = -\frac{12}{6}x \approx \frac{\cos \beta}{\cos \alpha} \cdot 3611.1111$$

$$= \frac{\cos(90^\circ + \arctan(\frac{5}{12}))}{\cos(\arctan(\frac{6}{5}))} \cdot 3611.1111$$



$$\sqrt{25+36} = \sqrt{61}$$

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5000/(sin(90+tan
-1(5/12))-6/5cos(
90+tan-1(5/12)))
3611.111111
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$$= \frac{\cos(90^\circ + \arctan(\frac{5}{12}))}{5/\sqrt{61}} \cdot 3611.1111$$

$$= \frac{\sqrt{61} \cos(90^\circ + \arctan(\frac{5}{12}))}{5} \cdot 36$$

$$\approx -2224.599243$$

$$\bullet \bullet \quad \|\sqrt{61}\| \approx 3611.11$$

$$\|\sqrt{5}\| \approx 2224.60$$

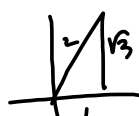
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5000/(sin(90+tan
-1(5/12))-6/5cos(
90+tan-1(5/12)))
3611.111111
Ans*\sqrt{61}*\cos(90
+tan-1(5/12))/5
-2224.599243
```

Find the angle θ (in radians) between the vectors.

3.4
#22

$$\mathbf{u} = \cos\left(\frac{\pi}{3}\right)\mathbf{i} + \sin\left(\frac{\pi}{3}\right)\mathbf{j}$$

$$\mathbf{v} = \cos\left(\frac{3\pi}{4}\right)\mathbf{i} + \sin\left(\frac{3\pi}{4}\right)\mathbf{j}$$



$$\theta = \boxed{} \times \boxed{\frac{5\pi}{12}}$$

$$\left(\frac{1}{2}\right)\left(-\frac{1}{\sqrt{2}}\right) + \left(\frac{\sqrt{3}}{2}\right)\left(\frac{1}{\sqrt{2}}\right) = \frac{\sqrt{3}-1}{2\sqrt{2}} = \cos\theta$$

$$\cos\theta = \frac{\mathbf{u} \cdot \mathbf{v}}{\|\mathbf{u}\| \|\mathbf{v}\|} = \frac{\cos\frac{\pi}{3} \cos\frac{3\pi}{4} + \sin\frac{\pi}{3} \sin\frac{3\pi}{4}}{(1)(1)}$$

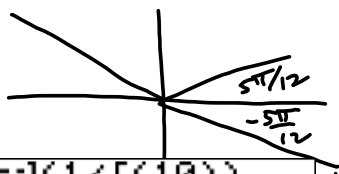
$$= \cos(u+v) = \cos u \cos v - \sin u \sin v$$

$$\cos(u-v) = \cos u \cos v + \sin u \sin v$$

$$= \cos\left(\frac{\pi}{3} - \frac{3\pi}{4}\right) = \cos\left(-\frac{5\pi}{12}\right) = \cos\theta \rightarrow$$

$$\theta = -\frac{5\pi}{12}$$

is not between 0° & 180°



$\cos^{-1}(1/\sqrt{10})$	
71.56505118	
$\cos^{-1}(-1/\sqrt{10})$	
108.4349488	
$\cos^{-1}((\sqrt{3}-1)/\sqrt{2})$	
75	

$$(75^\circ) - (100^\circ) = -\frac{5\pi}{12}$$