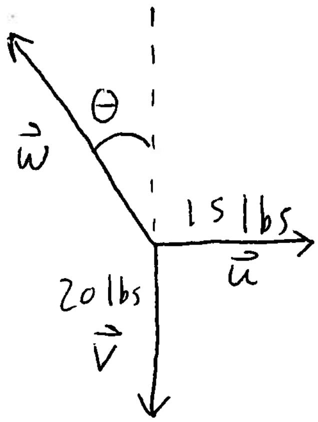
Math2210 Quiz 2 (Sections 11.2, 11.3) Summer, 2012 Dylan Zwick

Name Key Date 7-11-2012

Instructions: Please show all of your work as partial credit will be given where appropriate, **and** there may be no credit given for problems where there is no work shown.

1. Force $\boldsymbol{u}$ has a magnitude of 15 pounds in the East direction. Force $\boldsymbol{v}$ has a magnitude of 20 pounds in the South direction. Find the magnitude and direction (geometrically) of the force $\boldsymbol{w}$ needed to counterbalance $\boldsymbol{u}$ and $\boldsymbol{v}$. (Just write answers in as simplified a form as you can without a calculator.)



$$\|\vec{w}\| = \sqrt{(15\text{ lbs})^2 + (20\text{ lbs})^2} = 25\text{ lbs}$$

$$\theta = \tan^{-1}\left(\frac{15}{20}\right) = \tan^{-1}\left(\frac{3}{4}\right)$$ West of North

magnitude of $\boldsymbol{w}$: 25 lbs

direction of $\boldsymbol{w}$: N $\tan^{-1}\left(\frac{3}{4}\right)$ W

2. For $\boldsymbol{u}=\langle 0,4,2\rangle$ and $\boldsymbol{v}=4\boldsymbol{i}+3\boldsymbol{j}-2\boldsymbol{k}$,

(a) find $2\boldsymbol{u}-3\boldsymbol{v}$.

$$2\langle 0,4,2\rangle - 3\langle 4,3,-2\rangle$$
$$= \langle 0,8,4\rangle - \langle 12,9,-6\rangle = \langle -12,-1,10\rangle$$

~~$\boldsymbol{u}+2\boldsymbol{v}$~~ $2\vec{u}-3\vec{v}$ = $\langle -12,-1,10\rangle$

(b) find $\hat{\boldsymbol{u}}$.

$$\|\vec{u}\| = \sqrt{0^2+4^2+2^2} = \sqrt{20} = 2\sqrt{5}$$

$$\hat{u} = \frac{1}{2\sqrt{5}}\langle 0,4,2\rangle = \left\langle 0, \frac{2}{\sqrt{5}}, \frac{1}{\sqrt{5}}\right\rangle$$

$\hat{\boldsymbol{u}}$ = $\left\langle 0, \frac{2}{\sqrt{5}}, \frac{1}{\sqrt{5}}\right\rangle$

3. Find the projection of <2, 3, -3> onto the vector <1, 1, -2>

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$\vec{u} = \langle 2, 3, -3 \rangle \quad \vec{v} = \langle 1, 1, -2 \rangle$

$proj_{\vec{v}}(\vec{u}) = \frac{\vec{u} \cdot \vec{v}}{\vec{v} \cdot \vec{v}} \vec{v}$

$\vec{u} \cdot \vec{v} = 2(1) + 3(1) + (-3)(-2) = 11$

$\vec{v} \cdot \vec{v} = 1(1) + 1(1) + (-2)(-2) = 6$

$proj_{\vec{v}}(\vec{u}) = \frac{11}{6} \langle 1, 1, -2 \rangle = \langle \frac{11}{6}, \frac{11}{6}, -\frac{11}{3} \rangle$

projection: $\langle \frac{11}{6}, \frac{11}{6}, -\frac{11}{3} \rangle$

4. Circle all of the following statements that make sense.

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(a) $\boldsymbol{u} \cdot (\boldsymbol{v} - \boldsymbol{w})$

(b) $|\boldsymbol{u}|(\boldsymbol{v} \times \boldsymbol{w})$

(c) $(\boldsymbol{u} \times \boldsymbol{v}) \times \boldsymbol{w}$

(d) $(\boldsymbol{u} \cdot \boldsymbol{v}) \cdot \boldsymbol{w}$