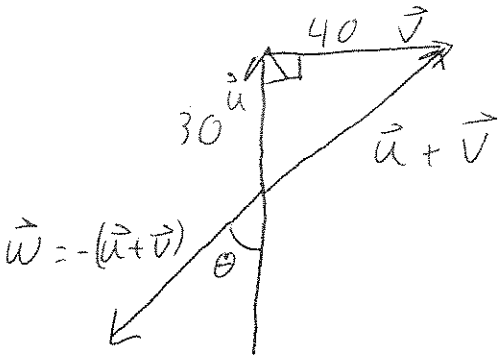
Math2210 Quiz 2 (Sections 11.2, 11.3) Summer, 2010 Dylan Zwick

Name Solutions Date 7/14/10

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. All answers should be completely simplified, unless otherwise stated.

1. Force u has a magnitude of 30 pounds in the North direction. Force v has a magnitude of 40 pounds in the East direction. Find the magnitude and direction (geometrically) of the force w needed to counterbalance u and v. (Just write answers in as simplified a form as you can without a calculator.)



$$|\vec{u}+\vec{v}| = \sqrt{30^2+40^2} = 50$$

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

$$\cos\theta = \frac{40}{50} \Rightarrow \theta = \cos^{-1}\left(\frac{4}{5}\right)$$

So, $\cos^{-1}\left(\frac{4}{5}\right)$ West of South.

magnitude of w : 50 pounds

direction of w : $\cos^{-1}\left(\frac{4}{5}\right)$ West of South.

2. For $u=\langle -2,5,1\rangle$ and $v=3i+1j-5k$.

(a) find $u+2v$.

$$\vec{u}+2\vec{v} = \langle -2+2(3),\ 5+2(1),\ 1+2(-5)\rangle$$
$$= \langle 4, 7, -9\rangle$$

$u+2v$ = $\langle 4, 7, -9\rangle$

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

$$||\vec{u}|| = \sqrt{(-2)^2+5^2+1^2} = \sqrt{30}$$

$$\hat{u} = \frac{1}{\sqrt{30}}\vec{u} = \frac{1}{\sqrt{30}}\langle -2, 5, 1\rangle$$

$\hat{u}$ = $\left\langle -\frac{2}{\sqrt{30}}, \frac{5}{\sqrt{30}}, \frac{1}{\sqrt{30}}\right\rangle$

3. Find the projection of <2, 1, -1> onto the vector <1, 5, 3>

$$\text{proj}_{\langle 1,5,3\rangle}\langle 2,1,-1\rangle = \frac{\langle 2,1,-1\rangle \cdot \langle 1,5,3\rangle}{\langle 1,5,3\rangle \cdot \langle 1,5,3\rangle}\langle 1,5,3\rangle$$

$$= \frac{2+5-3}{1^2+5^2+3^2}\langle 1,5,3\rangle$$

$$= \frac{4}{35}\langle 1,5,3\rangle = \left\langle \frac{4}{35}, \frac{4}{7}, \frac{12}{35}\right\rangle$$

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projection: $\frac{4}{35}\langle 1,5,3\rangle$

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

(a) $u\cdot(v+w)$

(b) $|u|(v+w)$

(c) $(u\cdot v)|w|$

(d) $(u\cdot v)\cdot w$