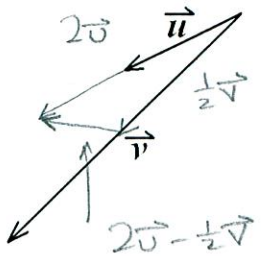
For the vectors $\vec{u}$ and $\vec{v}$ shown below, sketch the vector $2\vec{u} - \frac{1}{2}\vec{v}$.

SCORE: ____ / 2 PTS



Starting at the origin, you move 3 units to the right, 5 units down, and 6 units backward.

SCORE: ____ / 4 PTS

[a] What are the co-ordinates of your ending point ?

$(-6, 3, -5)$ (2)

(2) IF ALL COORDINATES CORRECT
(1) IF 2 OUT OF 3 CORRECT
(0) IF 0 OR 1 OUT OF 3 CORRECT

[b] In which ~~quadrant~~ OCTANT is your ending point ?

$2+4=6$ (1)

[c] How far is your ending point from the xz – plane ?

3 (1)

Let $\vec{p} = \langle 2, -6 \rangle$.

Let $\vec{q}$ be the vector with magnitude 12 and direction angle $\frac{7\pi}{6}$.

SCORE: ____ / 4 PTS

[a] Write $\vec{q}$ as a linear combination of $\vec{i}$ and $\vec{j}$.

$(12\cos\frac{7\pi}{6})\vec{i} + (12\sin\frac{7\pi}{6})\vec{j} = -6\sqrt{3}\,\vec{i} - 6\vec{j}$ (2)

[b] Write the component form of $\frac{1}{3}\vec{q} - 2\vec{p}$.

$\frac{1}{3}\langle -6\sqrt{3}, -6\rangle - 2\langle 2, -6\rangle = \langle -2\sqrt{3}, -2\rangle - \langle 4, -12\rangle$ ($\frac{1}{2}$) ($\frac{1}{2}$)

$= \langle -2\sqrt{3} - 4, 10\rangle$ (1)

Find the component form of the vector $\vec{g}$ in the same direction as $\langle -2, 6 \rangle$, such that $\| \vec{g} \| = 8$.

SCORE: ____ / 4 PTS

$\frac{1}{\|\langle -2,6\rangle\|}\langle -2,6\rangle = \frac{1}{\sqrt{40}}\langle -2,6\rangle = \frac{1}{2\sqrt{10}}\langle -2,6\rangle = \left\langle -\frac{1}{\sqrt{10}}, \frac{3}{\sqrt{10}}\right\rangle$ ($1\frac{1}{2}$) ($\frac{1}{2}$)

$8\left\langle -\frac{1}{\sqrt{10}}, \frac{3}{\sqrt{10}}\right\rangle = \left\langle \frac{-8}{\sqrt{10}}, \frac{24}{\sqrt{10}}\right\rangle$ ($1\frac{1}{2}$) ($\frac{1}{2}$)

Write $< 5, 12 >$ as the sum of two vectors, one parallel to $\vec{d} = < 2, -3 >$ and one perpendicular to $\vec{d}$. **SCORE: ____ / 4 PTS**

$$\frac{\langle 5,12\rangle \cdot \langle 2,-3\rangle}{\langle 2,-3\rangle \cdot \langle 2,-3\rangle}\langle 2,-3\rangle = \frac{-26}{13}\langle 2,-3\rangle = -2\langle 2,-3\rangle = \langle -4,6\rangle$$ (1) (1) (1)

$$\langle 5,12\rangle - \langle -4,6\rangle = \langle 9,6\rangle$$ (½)

$$\langle 5,12\rangle = \langle -4,6\rangle + \langle 9,6\rangle$$ (½)

Determine if the angle between the vectors $< -2, 33 >$ and $< 50, 3 >$ is acute, obtuse or right. **SCORE: ____ / 3 PTS**

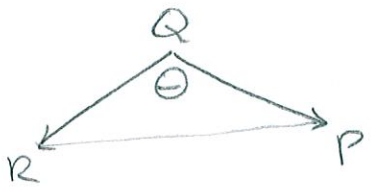
Justify your answer briefly.

$\langle -2,33\rangle \cdot \langle 50,3\rangle = -1 < 0$ OBTUSE

(1) (1) (1) ← MUST HAVE BOTH "< 0" AND "OBTUSE" TO GET ANY POINTS

If a triangle has vertices $P(2, -5)$, $Q(-1, -4)$ and $R(-5, -6)$, find the interior angle Q using the methods of sections 6.3, 6.4 and/or 11.1. **SCORE: ____ / 5 PTS**

$\overrightarrow{QP} = \langle 3,-1\rangle$ (½) $\overrightarrow{QR} = \langle -4,-2\rangle$ (½)



$$\cos\theta = \frac{\overrightarrow{QP}\cdot\overrightarrow{QR}}{\|\overrightarrow{QP}\|\|\overrightarrow{QR}\|}$$

$$= \frac{-10}{\sqrt{10}\sqrt{20}}$$ (1) (½) (½)

$$= \frac{-10}{10\sqrt{2}} = -\frac{1}{\sqrt{2}} = -\frac{\sqrt{2}}{2}$$ (1)

$$\theta = \frac{3\pi}{4}$$ (1)

Find the work done if the force represented by vector $< -9, 7 >$ moves an object from $(10, -1)$ to $(4, -6)$. **SCORE: ____ / 2 PTS**

$\langle -9,7\rangle \cdot \langle -6,-5\rangle = 19$ (½) (1) (½)

If $\vec{m} = < 4, 2 >$, $\| \vec{n} \| = 5$ and the angle between $\vec{m}$ and $\vec{n}$ is $\frac{5\pi}{6}$, find $\vec{m} \cdot \vec{n}$. **SCORE: ____ / 3 PTS**

$$\|\vec{m}\|\|\vec{n}\|\cos\theta = \sqrt{20}\cdot 5\cdot\frac{-\sqrt{3}}{2}$$ (1) (1)

$$= 2\sqrt{5}\cdot 5\cdot\frac{-\sqrt{3}}{2}$$

$$= -5\sqrt{15}$$ (1)