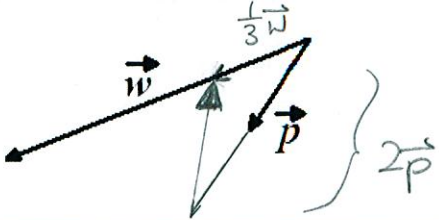
For the vectors shown below, sketch the vector $\frac{1}{3}\vec{w} - 2\vec{p}$.

SCORE: _____ / 3 PTS



WILL BE GRADED BY ME

If $\vec{a} = < 3, -2, 4 >$ is perpendicular to $\vec{b} = < c, 5, 6 >$, find the value of c.

SCORE: _____ / 3 PTS

$\vec{a} \cdot \vec{b} = 0$

$3(c) - 2(5) + 4(6) = 0$ (1 1/2)

$3c = -14$

$c = \frac{-14}{3}$ (1 1/2)

Write $\vec{d} = \langle 5, 1 \rangle$ as the sum of 2 vectors, one perpendicular to $\vec{g} = \langle -6, 4 \rangle$ and one parallel to $\vec{g}$.

SCORE: _____ / 6 PTS

$$\text{PROJ}_{\vec{g}}\,\vec{d} = \frac{\vec{d}\cdot\vec{g}}{\vec{g}\cdot\vec{g}}\vec{g} = \frac{5(-6)+1(4)}{(-6)^2+4^2}\langle -6, 4 \rangle$$

$$= \frac{-26}{52}\langle -6, 4 \rangle \quad (1\tfrac{1}{2})\ (1\tfrac{1}{2})$$

$$= \langle 3, -2 \rangle \quad (1)$$

$$\langle 5, 1 \rangle - \langle 3, -2 \rangle = \langle 2, 3 \rangle \quad (1)$$

$$\langle 5, 1 \rangle = \langle 3, -2 \rangle + \langle 2, 3 \rangle \quad (1)$$

Let $\vec{s} = -\vec{i} + 7\vec{k}$.

SCORE: ____ / 11 PTS

[a] Find a vector $\vec{t}$, with magnitude of 6, in the opposite direction as $\vec{s}$.
Write your answer in component form (ie. using angle bracket notation.)

$$-6\left(\frac{1}{\|\vec{s}\|}\right)\vec{s} = \frac{-6}{\sqrt{(-1)^2+7^2}}\langle -1, 0, 7\rangle = \frac{-6}{5\sqrt{2}}\langle -1, 0, 7\rangle = -\frac{3\sqrt{2}}{5}\langle -1, 0, 7\rangle = \left\langle \frac{3\sqrt{2}}{5}, 0, \frac{-21\sqrt{2}}{5}\right\rangle$$

(½ ½)

[b] If $\vec{s}$ represents a force that moves an object from $T = (2, 3, -8)$ to $M = (-1, -5, -6)$, find the work done.

$$\vec{s}\cdot\overrightarrow{TM} = \vec{s}\cdot\langle -1-2, -5-3, -6-(-8)\rangle = \langle -1, 0, 7\rangle\cdot\langle -3, -8, 2\rangle = (-1)(-3)+0(-8)+7(2) = 17$$

(1) POINT EACH EXCEPT AS NOTED

[c] If $\vec{q}$ is a vector of magnitude 3 such that $\vec{q}$ makes a 120° angle with $\vec{s}$, find $\vec{q}\cdot\vec{s}$.

$$\vec{q}\cdot\vec{s} = \|\vec{q}\|\,\|\vec{s}\|\cos 120^\circ = 3\cdot 5\sqrt{2}\cdot\left(-\tfrac{1}{2}\right) = \frac{-15\sqrt{2}}{2}$$

[d] Find the angle between $\vec{c} = \langle -3, 0, -4\rangle$ and $\vec{s}$.

$$\cos^{-1}\frac{\vec{c}\cdot\vec{s}}{\|\vec{c}\|\,\|\vec{s}\|} = \cos^{-1}\frac{(-3)(-1)+0+(-4)(7)}{\sqrt{(-3)^2+(-4)^2}\;5\sqrt{2}} = \cos^{-1}\frac{25}{25\sqrt{2}} = \cos^{-1}\frac{1}{\sqrt{2}} = \cos^{-1}\frac{\sqrt{2}}{2} = 45^\circ \text{ or } \frac{\pi}{4}$$

[FILL IN THE BLANKS] **SCORE: _____ / 7 PTS**

$(x+1)^2+(-4)^2+(z-9)^2=19$

[a] The equation of the $xz-$trace of the sphere $(x+1)^2+(y-4)^2+(z-9)^2=19$ is $(x+1)^2+(z-9)^2=3$ (1) (1).

[b] If $\vec{b}\cdot\vec{a}=-9$, then the angle between $\vec{a}$ and $\vec{b}$ is OBTUSE (1). **(NOTE: The answer is one word.)**

[c] You start at the origin in 3D, and move 6 units right, 8 units down, and 4 units backward. You are now at the point with co-ordinates $(-4,6,-8)$ (2) IF ALL 3 COORDINATES CORRECT, (1) IF 2 COORDINATES CORRECT, you are in octant 6 (1), and you are 4 (1) units away from the $yz-$ plane.