Let $\vec{d} = 2\vec{j} - 6\vec{i}$.

SCORE: ____ / 11 PTS

[a] Find a vector $\vec{s}$ in the same direction as $\vec{d}$, such that $\| \vec{s} \| = 4$.

$\frac{1}{\|\vec{d}\|}\vec{d} = \frac{1}{\sqrt{40}}\langle -6, 2\rangle = \frac{\sqrt{10}}{20}\langle -6, 2\rangle = \left\langle -\frac{3\sqrt{10}}{10}, \frac{\sqrt{10}}{10} \right\rangle$ (1) (1)

(1) $4\left\langle -\frac{3\sqrt{10}}{10}, \frac{\sqrt{10}}{10} \right\rangle = \left\langle -\frac{6\sqrt{10}}{5}, \frac{2\sqrt{10}}{5} \right\rangle$ (1)

[b] Write $\vec{g} = \langle -2, 34 \rangle$ as the sum of 2 vectors, one perpendicular to $\vec{d}$ and one parallel to $\vec{d}$.

$\frac{\vec{g} \cdot \vec{d}}{\vec{d} \cdot \vec{d}}\vec{d} = \frac{80}{40}\langle -6, 2\rangle = 2\langle -6, 2\rangle = \langle -12, 4\rangle$ (1) (1) (1)

$\langle -2, 34\rangle - \langle -12, 4\rangle = \langle 10, 30\rangle$ (1)

$\langle -2, 34\rangle = \langle -12, 4\rangle + \langle 10, 30\rangle$ (1)

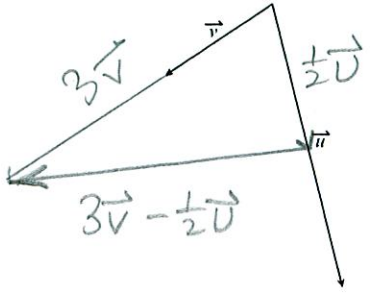
[c] If $\vec{p}$ is a vector with magnitude 6 which makes an angle of 150° with $\vec{d}$, find the **exact value** of $\vec{p} \cdot \vec{d}$.
No decimal answers allowed.

$\|\vec{p}\| \|\vec{d}\| \cos\theta = 6(2\sqrt{10})\left(-\frac{\sqrt{3}}{2}\right)$ (1)

$= -6\sqrt{30}$ (1)

For the vectors $\vec{u}$ and $\vec{v}$ shown below, sketch the vector $3\vec{v} - \frac{1}{2}\vec{u}$.

SCORE: ____ / 2 PTS



GRADED BY ME

Three forces act on an object. **SCORE: _____ / 12 PTS**

Force 1 has magnitude 7 newtons and direction angle $75°$.

Force 2 has magnitude 10 newtons and direction angle $125°$.

Force 3 has magnitude 3 newtons and direction angle $235°$.

[a] Find the resultant of the three forces in component form.

$7\langle \cos 75°, \sin 75° \rangle + 10\langle \cos 125°, \sin 125° \rangle + 3\langle \cos 235°, \sin 235° \rangle$ (1)

$= |\langle 1.8, 6.8 \rangle| + |\langle -5.7, 8.2 \rangle| + |\langle -1.7, -2.5 \rangle|$ (1) (1)

$= |\langle -5.6, 12.5 \rangle|$ (1)

★ OK IF YOU ROUNDED TO MORE DECIMAL PLACES

[b] Find the magnitude and direction angle of the resultant.

MAGNITUDE $= \sqrt{(-5.6)^2 + 12.5^2} = |13.7|$ (1)

DIRECTION ANGLE $= 180° + |\tan^{-1}\frac{12.5}{-5.6}| = 180° - |65.9°|$ (1)

(1) $= |114.1°|$ (1)

[c] The resultant of the three forces acted on the object to move the object from $(4, -9)$ to $(-1, -3)$, where all coordinates are measured in meters. Find the work done, and give appropriate units for your answer.

$\vec{d} = \langle -1-4, -3-(-9) \rangle = |\langle -5, 6 \rangle|$ (1)

$|\langle -5.6, 12.5 \rangle \cdot \langle -5, 6 \rangle| = |103|$ JOULES

(1) (1) (1)

[FILL IN THE BLANKS] **SCORE: _____ / 5 PTS**

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

[a] You start at the origin in 3D, and move 4 units down, 7 units backward, and 6 units right. You are now at the point with co-ordinates $(-7, 6, -4)$, you are in octant 6 (1), and you are 4 (1) units away from the $xy-$plane.

[b] If $\vec{a} \cdot \vec{b} = -3$, then the angle between $\vec{a}$ and $\vec{b}$ is OBTUSE (1)