**5.** (12 points) Let $\mathbf{u} = \langle 7, -3 \rangle$, $\mathbf{v} = \langle 2, 5 \rangle$ and $\mathbf{w} = \langle 4, 2 \rangle$. Find each of the following.

**a.** $5\mathbf{u} - 2\mathbf{v}$ $= 5\langle 7,-3\rangle - 2\langle 2,5\rangle$ (+2)

$= \langle 35,-15\rangle - \langle 4,10\rangle = \langle 31,-25\rangle$ (+2)

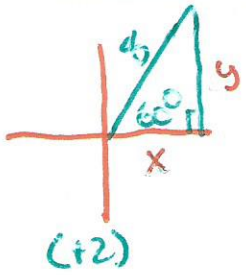
**b.** $|\mathbf{w}|$ $= \sqrt{(4)^2+(2)^2} = \sqrt{36+4} = \sqrt{40} = 2\sqrt{10}$

(+1) (+1) (+1) (+1)

**c.** $\left|\frac{1}{|\mathbf{w}|}\mathbf{v}\right|$ $= \left|\frac{1}{\sqrt{40}}\langle 2,5\rangle\right| = \left|\left\langle \frac{2}{\sqrt{40}}, \frac{5}{\sqrt{40}}\right\rangle\right| = \sqrt{\left(\frac{2}{\sqrt{40}}\right)^2+\left(\frac{5}{\sqrt{40}}\right)^2}$ (+1) (+1)

$\frac{1}{2}\sqrt{\frac{29}{10}} = \sqrt{\frac{29}{40}} = \sqrt{\frac{4}{40}+\frac{25}{40}}$ (+1) (+1)

**6.** (8 points) Find the horizontal and vertical components of the vector $\mathbf{z}$ with the given length and direction, and rewrite $\mathbf{z}$ in terms of the vectors $\boldsymbol{i}$ and $\boldsymbol{j}$: $|\mathbf{z}| = 8$, $\theta = 60°$




(+2)

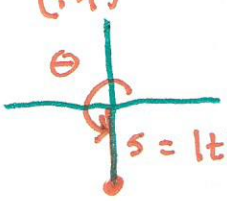
$\sin 60° = y/8$ (+1) $8\sin 60° = y = \frac{8\sqrt{3}}{2} = 4\sqrt{3}$ (+1)

$\cos 60° = x/8$ (+1) $8\cos 60° = x = \frac{8\cdot 1}{2} = 4$ (+1)

$z = 4i + 4\sqrt{3}j$ (+2)

**7.** (8 points) Find the length ($|t|$) and direction ($\theta$) of vector $\mathbf{t}$ with the component form: $\mathbf{t} = \langle 0, -5 \rangle$.

(+4)




(+2)

$\theta = \frac{3\pi}{2}$ (+2)

or

$|t| = \sqrt{(-5)^2+(0)^2} = \sqrt{25} = 5$ (+4)

reversed a²+b²

$\tan\theta = \frac{y}{x} = \frac{-5}{0} = \text{und}$

tan is und @ $\frac{\pi}{2}$ or $\frac{3\pi}{2}$ (+4)