1. (a) scalar (b) obtuse (c) No (d) Yes

For (d) $\vec{v}\cdot(\vec{a}+\vec{b}) = \vec{v}\cdot\vec{a} + \vec{v}\cdot\vec{b} = 0+0=0$, so $\vec{v}\perp(\vec{a}+\vec{b})$

2. $\vec{u}\cdot\vec{v} = 6+5=11$, $|\vec{u}| = \sqrt{5}$, $|\vec{v}| = \sqrt{34}$

$$\theta = \arccos\frac{\vec{u}\cdot\vec{v}}{|\vec{u}||\vec{v}|} = \arccos\frac{11}{\sqrt{5}\sqrt{34}}$$

$\vec{a}\cdot\vec{b} = 1+0-7=-6$, $|\vec{a}| = \sqrt{1+16+49} = \sqrt{66}$, $|\vec{b}| = \sqrt{2}$

$$\theta = \arccos\frac{\vec{a}\cdot\vec{b}}{|\vec{a}||\vec{b}|} = \arccos\frac{-6}{\sqrt{66}\sqrt{2}}$$

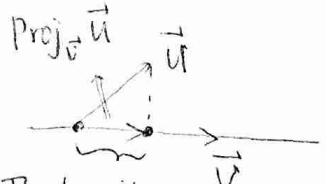
3. $\vec{a}\cdot\vec{c}=0 \Leftrightarrow \vec{a}\perp\vec{c}$,

so $\vec{a}\cdot\vec{c} = b+3b+2=0$, so $b=-\frac{1}{2}$

4. $\langle 1, 0, \frac{2}{3}\rangle$, $\langle 0, 1, 0\rangle$

5. $\text{Proj}_{\vec{v}}\vec{u} = \dfrac{\vec{u}\cdot\vec{v}}{|\vec{v}|^2}\vec{v}$

$\text{Comp}_{\vec{v}}\vec{u} = \dfrac{\vec{u}\cdot\vec{v}}{|\vec{v}|}$



The Length is $(\text{Comp}_{\vec{v}}\vec{u})$

$\dfrac{\vec{u}\cdot\vec{v}}{|\vec{v}|}\left(\dfrac{\vec{v}}{|\vec{v}|}\right)$

Length direction

(a) $\text{proj}_{\vec{v}}\vec{u} = \frac{7}{2}\langle 1,1\rangle$, $\text{Comp}_{\vec{v}}\vec{u} = \frac{7}{\sqrt{2}}$

(b) $\text{proj}_{\vec{v}}\vec{u} = \frac{-4}{5}\langle 1,2\rangle$, $\text{Comp}_{\vec{v}}\vec{u} = \frac{-4}{\sqrt{5}}$

(c) $\text{proj}_{\vec{v}}\vec{u} = \frac{-4}{1}\vec{k} = -4\vec{k}$, $\text{Comp}_{\vec{v}}\vec{u} = \frac{-4}{1} = -4$