MA 1111: Linear Algebra I

Selected answers/solutions to the assignment for September 21, 2018

1. (**a**) no, the vectors from $(1,0)$ to these points are $(5,8)$ and $(8,13)$, and they are not proportional; (**b**) yes, the vectors formed by the sides of this triangle are $(3,4)$, $(5,-10)$, and $(8,-6)$. Clearly, the scalar product of $(3,4)$ and $(8,-6)$ is equal to zero, so these vectors are perpendicular.

2. $\mathbf{u}\cdot\mathbf{v} = 2-3-1 = -2$, $\mathbf{v}\cdot\mathbf{w} = 0+6-1 = 5$, $\mathbf{v}\times\mathbf{w} = (5,-2,4)$, $\mathbf{u}\times\mathbf{w} = (-3,-1,2)$, $\mathbf{u}\cdot(\mathbf{v}\times\mathbf{w}) = 5+2+4 = 11$, $\mathbf{v}\cdot(\mathbf{u}\times\mathbf{w}) = -6-3-2 = -11$.

3. (**a**) $|\mathbf{v}\times\mathbf{w}| = \sqrt{25+4+16} = \sqrt{45}$; (**b**) $|\mathbf{u}\cdot(\mathbf{v}\times\mathbf{w})| = 11$.

4. Direct inspection for $(1,0)$ and $(0,1)$; then note that addition defined geometrically, so adding and then rotating is the same as rotating and then adding.