Quiz #4 - EconS 526

December 3rd, 2018

Question #1 (50 Points)

Calculate all values of scalar r if $\mathbf{v} = (-2, 3, 0, 6)$ and $\|r\mathbf{v}\| = 5$.

Solution

$$\begin{aligned} \|r\mathbf{v}\| &= |r| \cdot \|\mathbf{v}\| \\ &= |r| \sqrt{4 + 9 + 0 + 36} \\ &= |r| \sqrt{49} \end{aligned}$$

$$\|r\mathbf{v}\| = |r| \sqrt{49} = 5$$

then

$$r = \frac{5}{\sqrt{49}} = \pm\frac{5}{7}$$

Question #2 (50 Points)

Show that the length of $\left[\frac{1}{\|\mathbf{v}\|} \cdot \mathbf{v}\right]$ is equal to 1,where $\mathbf{v} = (v_1, v_2, v_3)$

Solution

$$\frac{1}{\|\mathbf{v}\|} = \frac{1}{\sqrt{v_1^2 + v_2^2 + v_3^2}}$$

and

$$\frac{1}{\|\mathbf{v}\|} \cdot \mathbf{v} = \left(\frac{v_1}{\sqrt{v_1^2 + v_2^2 + v_3^2}}, \frac{v_2}{\sqrt{v_1^2 + v_2^2 + v_3^2}}, \frac{v_3}{\sqrt{v_1^2 + v_2^2 + v_3^2}} \right)$$

hence the length of $\left[\frac{1}{\|\mathbf{v}\|} \cdot \mathbf{v}\right]$ is

$$\sqrt{\left(\frac{v_1^2}{v_1^2 + v_2^2 + v_3^2} + \frac{v_2^2}{v_1^2 + v_2^2 + v_3^2} + \frac{v_3^2}{v_1^2 + v_2^2 + v_3^2} \right)}$$

$$\sqrt{\left(\frac{v_1^2 + v_2^2 + v_3^2}{v_1^2 + v_2^2 + v_3^2} \right)} = 1$$