جامعة الملك سعود
King Saud University

MATH 244 - Second Quiz

1st Semester, 1442 H

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Name: _____ ID:_____

Question I Let $\boldsymbol{u} = (-3,2,1)$, $\boldsymbol{v} = (4,7,-3)$ and $\boldsymbol{w} = (5,-1,2)$.

Find the components of

(a) $-\boldsymbol{u} + (\boldsymbol{v} + 4\boldsymbol{w})$

(b) The vector $\boldsymbol{x}$ which satisfies the equation $\boldsymbol{u} + \boldsymbol{v} = 2\boldsymbol{x} + \boldsymbol{w}$

a) $= -(-3,2,1) + ((4,7,-3) + 4(5,-1,2))$

$= (3,-2,-1) + ((4,7,-3) + (20,-4,8))$

$= (3,-2,-1) + (24,3,5)$

$(27,1,4)$

b) $2x + w = u + v$

$2x = u + v - w$

$x = \frac{u+v-w}{2}$

$x = \frac{(-3,2,1) + (4,7,-5) - (5,-1,2)}{2}$

$x = (-2,5,-2)$

Question II: Determine whether the following is true or false. Justify your answer.

(i) $\boldsymbol{z} = \left(\frac{1}{\sqrt{2}}, 0, \frac{1}{\sqrt{2}}\right)$ is a **unit** vector (T)

$z_1 \; z_2 \; z_3$

$\|z\| = \sqrt{(z_1)^2 + (z_2)^2 + (z_3)^2} = 1$ $\Rightarrow$ If the norm of the vector is 1 then the vector is called unit vector

$\sqrt{\left(\frac{1}{\sqrt{2}}\right)^2 + 0^2 + \left(\frac{1}{\sqrt{2}}\right)^2} = 1$ is unit vector

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(ii) If $\boldsymbol{u}_1 = (1, -3, 4)$ and $\boldsymbol{u}_2 = (0, 2, 5)$, then the distance between $\boldsymbol{u}_1$ and $\boldsymbol{u}_2$ is $d(\boldsymbol{u}_1, \boldsymbol{u}_2) = 6$ (F)

$$d(u_1, u_2) = \|u_1 - u_2\| = \sqrt{(\quad)^2 + (\quad)^2 + (\quad)^2}$$

يعني الفرق بين u_1 و u_2 كل واحد مما يقابله

$$\sqrt{(1-0)^2 + (-3-2)^2 + (4-5)^2} = 3\sqrt{3} = 5.19$$

$$5.19 \neq 6$$

(iii) If $\boldsymbol{v}_1 = (2, 0, -1)$ and $\boldsymbol{v}_2 = (3, 1, -2)$, then the dot product $\boldsymbol{v}_1 \cdot \boldsymbol{v}_2 = 8$ (T)

$$v_1 \cdot v_2 = v_{1_1} v_{2_1} + v_{1_2} v_{2_2} + v_{1_3} v_{2_3}$$

$$v_1 \cdot v_2 = (2*3) + (0*1) + (-1*-2) = 8$$

(iv) If $\boldsymbol{u} \cdot \boldsymbol{v} = 3$ and $\|\boldsymbol{u} + \boldsymbol{v}\| = 4$, then $\|\boldsymbol{u} - \boldsymbol{v}\| = 2$ (T)

قانون

$$u \cdot v = \frac{1}{4}\|u+v\|^2 - \frac{1}{4}\|u+v\|^2$$

$$3 = \frac{1}{4}(4)^2 - \frac{1}{4}(2)^2$$

$$3 = 3 \quad \checkmark$$

Good Luck ☺