

Name: key

Calculus 251:C3 Quiz #2 - 6/2/2021 Topic: Sections 12.1-12.2

Instructions. Answer the questions in the spaces provided or on your own paper, then scan and upload to Canvas. Show and label all of your work. Responses with no work may receive no credit even if the answer is correct.

3 pts

- (1) Describe the set of points in \mathbb{R}^3 which satisfy $x^2 - 4x + y^2 + 6y + z^2 + 2z - 11 = 0$.

$$x^2 - 4x + 4 + y^2 + 6y + 9 + z^2 + 2z + 1 = 11 + 4 + 9 + 1$$

$$(x-2)^2 + (y+3)^2 + (z+1)^2 = 25$$

sphere of radius 5 with center $(2, -3, -1)$

2 pts

- (2) Find the distance between the points $P(0, -4, 12)$ and $Q(-2, 4, 8)$

$$d = \sqrt{(0 - (-2))^2 + (-4 - 4)^2 + (12 - 8)^2}$$

$$= \sqrt{4 + 64 + 16}$$

$$= \sqrt{84}$$

$$= 2\sqrt{21}$$

(3) Given the vectors $\vec{v} = 2\hat{i} + 3\hat{j} - 6\hat{k}$ and $\vec{w} = 4\hat{i} - 2\hat{j}$

1 pt (a) Find $\|\vec{v}\|$

$$\|\vec{v}\| = \sqrt{2^2 + 3^2 + 6^2} = \sqrt{4 + 9 + 36} = \sqrt{49} = 7$$

1 pt (a) Find $\vec{w} - \vec{v}$

$$= \langle 4, -2, 0 \rangle - \langle 2, 3, -6 \rangle = \langle 2, -5, 6 \rangle$$

$$\begin{array}{c} \text{or} \\ 2\hat{i} - 5\hat{j} + 6\hat{k} \end{array}$$

3 pts

(4) Let $P = (5, 7, -1)$ and $Q = (2, 9, -2)$. Find the component form of \vec{PQ} , write \vec{PQ} as a linear combination of the standard basis vectors, and find the midpoint of \vec{PQ} .

$$\vec{PQ} = \langle -3, 2, -1 \rangle$$

$$= -3\hat{i} + 2\hat{j} - \hat{k}$$

midpoint is $\left(\frac{7}{2}, 8, \frac{-3}{2}\right)$