

MIDTERM (1)



Kingdom of Saudi Arabia

AL-Imam Mohammed Bin Saud

Islamic University

College of Science

Department of Mathematics

Course: Calculus III

Course code: MAT 203

Semester: 1st /1438

Duration: 1Hour

Dr. Ghaliah Alhamzi

Name	
Student Number	
Section	

Question's number	Marks
1	10
2	10
TOTAL	20

Question 1

(i) Determine whether the given pair of vectors is parallel $\vec{a} = \langle 1, -2, 5 \rangle$ and $\vec{b} = \langle 3, -6, 15 \rangle$. (2 Marks)

(ii) Show that the two vectors $\vec{a} = 3\hat{i}$ and $\vec{b} = 6\hat{j} - 2\hat{k}$ are orthogonal. (2 Marks)

(iii) Find the angle between the vectors $\vec{a} = \langle 0, -2, 3 \rangle$ and $\vec{b} = \langle 1, 1, 2 \rangle$. (3 Marks)

(v) Find equations for the line passing through the points $P(1, 2, -1)$ and $Q(5, -3, 4)$. (3 Marks)

Question 2

- (i) Find the velocity and position of an object at any time t , given that its acceleration is

$$\vec{a}(t) = e^t \hat{i} + e^{-t} \hat{k}$$

its initial velocity is $\vec{v}(0) = \hat{i} + 2\hat{j}$ and its initial position is $\vec{r}(0) = 3\hat{i} + \hat{j} + 2\hat{k}$.

(4 Marks)

- (ii) Find unit tangent vector $\vec{T}(t)$, unit normal vectors $\vec{N}(t)$ and the curvature κ to the curve defined by

$$\vec{r}(t) = \cos t \hat{i} + \sin t \hat{j} + t \hat{k}.$$

(6 Marks)