

First Midterm Exam
Academic Year 1447 Hijri- Second Semester

Exam Information معلومات الامتحان		
Course name	Vector Calculus حساب المتجهات	اسم المقرر
Course Code	202 رياض	رمز المقرر
Exam Date	2026-03-01	1447-09-12 تاريخ الامتحان
Exam Time	11: 15 AM	وقت الامتحان
Exam Duration	2 hours	مدة الامتحان
Classroom No.	G100	رقم قاعة الاختبار
Instructor Name	هناء السديس	اسم استاذ المقرر

Student Information معلومات الطالب		
Student's Name		اسم الطالب
ID number		الرقم الجامعي
Section No.		رقم الشعبة
Serial Number		الرقم التسلسلي

General Instructions:

- Your Exam consists of 4 PAGES (except this paper)
- Keep your mobile and smart watch out of the classroom.
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- عدد صفحات الامتحان 4 صفحة. (باستثناء هذه الورقة)
- يجب إبقاء الهواتف والساعات الذكية خارج قاعة الامتحان.
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هذا الجزء خاص بأستاذ المادة

This section is ONLY for instructor

#	Course Learning Outcomes (CLOs)	Related Question (s)	Points	Final Score
1	1.1	3(i)	/1	
2	1.2	2	/2	
3	2.1	1+4+6(i,ii)	/7	
4	2.2	3(ii,iii)+5+6(iii,iv)	/10	
5				/20
6				
7				
8				

<u>Question</u>	1	2	3(i)	3(ii,iii)	4	5	6(i, ii)	6(iii,iv)	Total
<u>Mark</u>									

1. Describe the set of points S that satisfy the inequality [1.5 points]

$$x^2 + y^2 + z^2 + 4x > 2z.$$

2. If $\vec{u}, \vec{v}$ are nonzero vectors in space, prove that

$$\|\vec{u} \times \vec{v}\| = \|\vec{u}\| \|\vec{v}\| \sin \theta,$$
where θ is the angle between $\vec{u}$ and $\vec{v}$. [2 points]

3. Let, $\vec{u}$, $\vec{v}$ and $\vec{w}$ be vectors in space

[1+1+2=4 points]

(i) What do we mean by saying that $\vec{u}$, $\vec{v}$ and $\vec{w}$ are coplanar?

(ii) Determine whether $\vec{u} = 4i - 4j + 2k$, $\vec{v} = j + 2k$ and $\vec{w} = -2i + 2j - k$ are coplanar or not.

(iii) Prove that $\vec{u}$ is orthogonal to $\vec{v}$, and that $\vec{u}$ is parallel to $\vec{w}$, **use this to compute** $\vec{u} \times (\vec{v} \times \vec{w})$.

4. Determine whether the two lines parametrized by:

$$L_1: \begin{cases} x = 4 + t \\ y = 1 - 2t \\ z = -3 - 3t \end{cases} \quad \text{and} \quad L_2: \begin{cases} x = -2 + t \\ y = 7 + t \\ z = 5 + 2t \end{cases}$$

intersect, if so, find the point of intersection.

[2.5 points]

5. Let $P = (4, -4, 2)$, $Q = (2, -2, 5)$, $R = (2, 4, 0)$ and $S = (2, 2, 4)$. Then

[1.5+2=3.5 points]

- (i) Sketch the vector $\overrightarrow{PQ}$, find the direction of $\overrightarrow{PQ}$, i.e., the unit vector in the direction of $\overrightarrow{PQ}$.
- (ii) Find the area of the triangle determined by the vectors $\overrightarrow{PQ}$ and $\overrightarrow{RS}$.

6. Given the equation of two planes:

[1+2+1.5+2=6.5 points]

$$x + 2y - z = 0, \quad \text{and} \quad 2x - y - z = 2.$$

- (i) Find the equation of the plane parallel to the plane $x + 2y - z = 0$, and passing through the point $(2, 0, 4)$.
- (ii) Find the parametric equation of the line of intersection of the two planes.
- (iii) Find the angle between the two planes.
- (iv) Find the distance from the plane $2x - y - z = 2$ to the point $P(1, 3, 2)$.

Good Luck 😊