

MAT 1341A: Introduction to Linear Algebra
Professor : Hai Yan Liu (Jack)

Diagnostic test – V.1

September 12, 2019

Family name _____ First name _____

Student number _____

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY:

- You have 60 minutes to complete this exam.
- This is a closed book exam.
- Calculators **are not permitted**.
- **Please do not separate** the pages of the test booklet.
- All questions are multiple choice, are worth 1 point each and no part marks will be given. Please **record your answers in the table on the second page**.
- For your reference, there is a table of values of trigonometric functions printed on the second page.
- Cell phones and other electronic devices are not allowed. All such devices must be turned off and stored in your bag under your desk: Do not keep them on your person, such as in your pockets. If caught with such a device, academic fraud allegations may be filed which may result in you obtaining a zero for the exam.
- Good luck!!!

By signing below, you confirm that you are complying with the above instructions.

Signature: _____

Student number _____

Please record your answers in this table.

1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total	

Table of values of trigonometric functions

θ	$\sin \theta$	$\cos \theta$
0	0	1
$\frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$
$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$
$\frac{\pi}{2}$	1	0

1. An equation of the plane parallel to the vector $(1, 0, 3)$ and which passes through the points $(0, 1, 1)$ and $(-3, 5, 2)$ is:

A $3x + 2y + z = 3$

B $4x + 3y - 2z = 1$

C $5x - 3y - 2z = 7$

D $6x + 5y - 2z = 3$

E $5x + 4y - z = 3$

F $2x - 9y + 6 = 4$

Answer is D , see version 2 , question 9

2. Parametric equations of the line containing $(1, -1, 2)$ and which is parallel to the two planes $x + 3y + 2z = 0$ and $4x - y - z = 1$ are:

A $x = 1 - t, y = -1 + 9t, z = 2 - 13t, t \in \mathbb{R}$

B $x = -1 + 4t, y = -1 - 4t, z = 2 + 5t, t \in \mathbb{R}$

C $x = t, y = -t, z = 2t, t \in \mathbb{R}$

D $x = 1 - t, y = -1 + 9t, z = 2 + 13t, t \in \mathbb{R}$

E $x = -1 - t, y = 1, z = -13t, t \in \mathbb{R}$

F $x = -1 + 3t, y = -1 - t, z = 2 + 4t, t \in \mathbb{R}$

Answer is A, see version 2, question 7

3. If $\mathbf{u} = (-2, -3, 1)$, $\mathbf{v} = (2, 1, 0)$, $\mathbf{w} = (1, 0, 1)$ then the cosine of the angle between $(\mathbf{v} \times \mathbf{w})$ and $(\mathbf{u} \times \mathbf{v})$ is:

A $\frac{1}{14}$

B $-\frac{1}{\sqrt{21}}$

C $\frac{2}{21}$

D $\frac{\sqrt{2}}{\sqrt{21}}$

E $-\frac{1}{\sqrt{14}}$

F $-\frac{3}{\sqrt{14}}$

Answer is F, see version 2 , Question 6.

4. If $\mathbf{u} = (1, 2, 1)$ and $\mathbf{v} = (-7, 4, 1)$, the orthogonal projection of \mathbf{v} along \mathbf{u} is:

A $(-2, -4, -2)$

B $(-\frac{1}{3}, -\frac{2}{3}, -\frac{1}{3})$

C $(-\frac{1}{6}, -\frac{1}{3}, -\frac{1}{6})$

D $(2, 4, 2)$

E $(\frac{1}{6}, \frac{1}{3}, \frac{1}{6})$

F $(\frac{1}{3}, \frac{2}{3}, \frac{1}{3})$

Answer is F, see version 2, question 8.

5. The volume of the parallelepiped with edges given by the vectors $\mathbf{u} = (1, 2, 3)$, $\mathbf{v} = (1, 1, 1)$ and $\mathbf{w} = (3, 1, 1)$ is:

A 2

B $\sqrt{2}$

C $2\sqrt{2}$

D 4

E 1

F $\frac{1}{\sqrt{2}}$

Answer is A, see version 2 , Question 10.

6. Given $P(-1, 1, 0)$, $Q(2, 0, -1)$, $R(0, 1, 2)$, find the area of triangle PQR .

A $\sqrt{54}$

B $\frac{\sqrt{54}}{2}$

C $\sqrt{34}$

D $\frac{\sqrt{34}}{2}$

E $\frac{5}{2}$

F $\sqrt{26}$

Answer is B, see version 2 , question 3.

7. Find the equation of the plane passing through the two points $P(2, -1, 4)$ and $Q(-1, 3, 0)$ that is perpendicular to the plane $3x - 4y + 5z = 0$.

A $2x - y + 4z = 21$

B $3x - 4z = 4$

C $12x + 4y - 5z = 0$

D $-x + 3y = 3$

E $4x + 3y = 5$

F $-x + 3y = 5$

Answer is E, see version 2, Question 2.

8. Find the scalar equation for the plane with vector parametric equation

$$\nu = (0, 1, -1) + s(1, -1, 2) + t(4, -6, 2); \quad s, t \in \mathbb{R}$$

A $y - 3z = 5$

B $x - y + 2z = 4$

C $2x + 3y - 8z = 2$

D $3x - y - z = 4$

E $3x - 2y + 2z = 1$

F $10x + 6y - 2z = 8$

Answer is F, see version 2, Question 4.

9. Consider the line L passing through the points $(-1, 3, 2)$ and $(1, 2, 1)$. Find the point of intersection of L with the plane $x + y - 2z = 4$.

A $(3, 1, 0)$

B $(2, 1, 0)$

C $(2, 1, 1)$

D $(3, 1, 1)$

E $(3, 1, 2)$

F $(3, 2, 2)$

Answer is A, see version 2, Question 1.

10. The set of vectors in \mathbb{R}^3 perpendicular to vectors $(-1, 1, 2)$ and $(1, 2, 3)$ is

A $\{(2, 9, 3)\}$

B $\{(-1 + t, 3 + 2t, t) | t \in \mathbb{R}\}$

C $\{(t, 0, 2t) | t \in \mathbb{R}\}$

D $\{(-t, 5t, -3t) | t \in \mathbb{R}\}$

E $\{(0, 0, 0)\}$

F $\{(3, 2, -10)\}$

Answer is D, see version 2, question 5.

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