

Exam Scores

*Do not write in
the table below*

Name: _____

Section: _____

Last 4 digits of student ID #: _____

- No books or notes may be used.
- Turn off all your electronic devices and do not wear ear-plugs during the exam.
- You may use a calculator, but not one which has symbolic manipulation capabilities or a QWERTY keyboard.
- Additional blank sheets for scratch work are available upon request.
- All questions are free response questions. Show all your work on the page of the problem. Clearly indicate your answer and the reasoning used to arrive at that answer. Unsupported answers may not receive credit.

Question	Score	Total
1		9
2		8
3		8
4		9
5		8
6		10
7		9
8		9
9		10
10		10
11		10
Total		100

Free Response. Show your work!

1. (9 points) Find the center and radius of the sphere

$$2x^2 + 2y^2 + 2z^2 = 8x - 24z + 1.$$

2. (8 points) Find a unit vector parallel to $\mathbf{a} = \langle 8, -1, 4 \rangle$ and having negative first coordinate.

3. (8 points) Find a vector that is orthogonal to both $\mathbf{i} + \mathbf{j}$ and $\mathbf{i} + \mathbf{k}$.

Free Response. Show your work!

4. (9 points) Find the volume of the parallelepiped with adjacent edges PQ , PR , and PS , where

$$P = (-2, 1, 0), \quad Q = (2, 3, 2), \quad R = (5, 4, -1), \quad S = (3, 6, 1).$$

5. (8 points) Find an equation of the plane through the point $(1, -1, -1)$ and parallel to the plane

$$5x - y - z = 6.$$

Free Response. Show your work!

6. (10 points) Find an equation of the plane with x -intercept a , y -intercept b , and z -intercept c .

7. (9 points) Reduce the surface

$$9x^2 + 4z^2 = y^2 + 36$$

to one of the standard forms and classify it according to the provided table.

Free Response. Show your work!

8. (9 points) Find a vector function that represents the curve of intersection of the hyperboloid $z = x^2 - y^2$ and the cylinder $x^2 + y^2 = 1$.

9. (10 points) Find parametric equations for the tangent line to the curve

$$x = t \cos t, \quad y = t, \quad z = t \sin t$$

at the point $(-\pi, \pi, 0)$.

Free Response. Show your work!

10. (10 points) Compute the curvature $\kappa(t)$ of the plane curve

$$y = 2x - x^2.$$

Free Response. Show your work!

11. (10 points) A ball is thrown from the ground at an angle of 45° to the ground. If the ball lands 90 m away, what was the initial speed of the ball? [You may need to use the value $g = 9.8 \text{ m/sec}^2$ for the acceleration due to gravity. The answer should be in m/sec.]