

Midterm 2 Sample
Math UN1101: Calculus III, Section 2
Spring 2019
Instructor: Linh Truong

Name: _____

Instructions:

- Print your name in the space above.
- Show your reasoning and intermediate computations.
- You have 75 minutes.
- No notes, books, calculators or any other electronic devices are allowed.
- Write answers in the space provided. If you need extra space, use the backs of pages.

Question	Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
Total:	60	

1. Determine whether or not the following limits exist. If it exists, evaluate the limit. Justify your answers.

(a) (5 points)

$$\lim_{(x,y) \rightarrow (0,0)} \frac{x^3 + y^3}{(x^2 + y^2)^{3/2}}$$

(b) (5 points)

$$\lim_{(x,y) \rightarrow (0,0)} \frac{x(x^2 + y^4)^2}{2x^2 + y^4}$$

2. (a) (5 points) Find a vector function that represents the curve of intersection of $4x^2 + 3y^2 + 2z^2 = 16$ and the plane $y = 2$.

(b) (5 points) Find the parametric equations of the tangent line to this curve at the point $(1, 2, 0)$.

3. Write true or false. Justify your answer.

(a) (2 points) The curve parametrized by $\langle \sin(2t), \cos(3t), 1+t^3 \rangle$ never intersects the xy -plane.

(b) (2 points) The curve parametrized by $\langle \sin(2t), t, \cos(2t) \rangle$ traces a helix.

(c) (2 points) The graph of $f(x, y) = x^2 + y^2$ is a hemisphere.

(d) (2 points) The curve parametrized by $\langle \sin(2t), \cos(2t), \sin(t) \rangle$ lies on the surface $x^2 + y^2 = 1$.

(e) (2 points) For two vector functions $\vec{r}_1(t)$ and $\vec{r}_2(t)$ we have

$$\frac{d(\vec{r}_1(t) \times \vec{r}_2(t))}{dt} = \vec{r}_1'(t) \times \vec{r}_2'(t)$$

4. Suppose $\vec{r}(t) = \langle \sqrt{2} \cos(t), t - \sin(t), t + \sin(t) \rangle$.

(a) (5 points) Find the unit tangent vector and evaluate at $t = \pi/2$.

(b) (5 points) Find the equation of a surface that the curve lies on.

5. (a) (5 points) Suppose that z is defined implicitly as a function of x and y by the equation

$$ze^z = x^2 + y^2.$$

Find $\partial z/\partial x$ and $\frac{\partial^2 z}{\partial x \partial y}$.

- (b) (5 points) Suppose $f(x, y, z) = \cos(x^2y^3z) + \arcsin(3x + y)$.
Find $\partial f/\partial z$ and f_{yz} .

6. Match each of the following functions with its contour map.

(a) (4 points) $f(x, y) = \tan(x + y)$

(b) (3 points) $g(x, y) = y^2 + x^2$

(c) (3 points) $h(x, y) = y^2 - x^2$

