Math 126

Your Name



Student ID #

Professor's Name

Your Signature

Quiz Section

TA's Name

- This exam is closed book. You may use one $8\frac{1}{2} \times 11$ sheet of handwritten notes (both sides may be used).
- Graphing calculators are not allowed. Do not share notes.
- In order to receive credit, you must show your work. Do not do computations in your head. Instead, write them out on the exam paper.
- Place a box around **YOUR FINAL ANSWER** to each question.
- If you need more room, use the backs of the pages and indicate to the reader that you have done so.
- Raise your hand if you have a question.

Problem	Total Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	

Problem	Total Points	Score
6	10	
7	10	
8	10	
9	10	
10	10	
Total	100	

1. [10 points] Find the Taylor polynomial of degree 2 centered at x = -1 for the function $f(x) = x^3 + 2x + 4\cos(\pi x)$.

2. [10 points] Use Taylor's inequality to find n such that the Taylor polynomial of degree n centered at x = 0 for the function $g(x) = e^{2x}$ approximates g(x) with accuracy 0.01 on the interval [-.5, 0].

3. [10 points] Find the equation of the line of intersection of the two planes given by x + 2y + 3z = 0 and x - y = 3.

4. [10 points] Two elementary particles are on a collision course (that is, at some instant of time, they will be at the same location). The position of one of them is given by

$$x = 2\sin t, \ y = 2\cos t,$$

the position of the other one is

$$x = 3 - 4 \sin t, \ y = 2 \cos t$$

for time $t \ge 0$. Find the cosine of the angle between the velocity vectors of the two particles at the instant the particles collide.

5. [10 points] While driving your car on a highway, you travel at a constant speed of 100 ± 2 km/hour for 40 ± 1 seconds. Use differentials to estimate the uncertainty in the distance you travelled in these 40 seconds.

6. [10 points] A sheet of material covering the first quadrant $(x \ge 0, y \ge 0)$ has a surface density (mass per area) given by

$$\rho(x,y) = 6e^{-2x-3y}.$$

What is the total mass of that part of the sheet enclosed by the triangular area whose vertices are located at (1,0), (0,0), (0,1)?

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Final Examination

7. [10 points] Evaluate the integral

$$I = \int_0^1 \int_{\sqrt{y}}^1 \sqrt{x^3 + 1} \, dx dy.$$

8. [10 points] Consider the surface

$$x^2 + y^2 + z^2 = 1$$

and let (a, b, c) be some point on the surface. Find an equation for the plane tangent to this surface at (a, b, c). Simplify your answer as much as possible.

9. [10 points] Suppose the trajectory of a particle is given by

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

Calculate the magnitude of the normal component of the acceleration experienced by the particle at t = 1.

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Final Examination

10. [10 points] Consider the parametric curve given, for $t \ge 0$, by

$$\mathbf{r}(t) = \left\langle \cos t^2, \sin t^2, \frac{\sqrt{5}}{2}t^2 \right\rangle$$

(a) Reparameterize the curve using arc length measured from the point (1, 0, 0).

(b) Find the curvature of the curve.