## Math 126

Your Name

## Your Signature

Quiz Section

Professor's Name

• CHECK that your exam contains 8 problems on 8 pages.

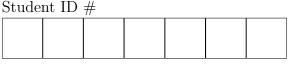
- This exam is closed book. You may use one  $8\frac{1}{2} \times 11$  sheet of notes and a TI-30X IIS calculator. Do not share notes or calculators.
- Unless otherwise specified, you should give your answers in exact form. (For example,  $\frac{\pi}{4}$  and  $\sqrt{2}$  are in exact form and are preferable to their decimal approximations.)
- In order to receive full credit, you must show all of your work.
- 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. DO NOT USE SCRATCH PAPER.
- Raise your hand if you have a question.

Problem	Total Points	Score
1	10	
2	12	
3	12	
4	14	
5	14	

Problem	Total Points	Score
6	12	
7	12	
8	14	
Total	100	

TA's Name





- 1. (10 points) Each of the following multiple choice problems has one correct answer. Circle it. You do not need to show any reasoning.
  - (a) Suppose  $\operatorname{comp}_{\mathbf{a}}\mathbf{b} = \frac{1}{2}|\mathbf{b}|$ . Then the angle between  $\mathbf{a}$  and  $\mathbf{b}$  is... (i) 30°. (ii) 45°. (iii) 60°. (iv) 90°.
  - (b) Suppose S is the set of points P such that the distance from P to the x-axis is equal to 3. Then S is...
    - (i) a plane. (ii) a cylinder. (iii) a sphere. (iv) a cone.
  - (c) The surface  $z = x^2 + 2xy$  is tangent to the plane z = 6x + 4y 8 at the point... (i) (-2, 3, -8) (ii) (0, 2, 0). (iii) (2, 1, 8). (iv) (4, 0, 16).
  - (d) The value of  $\int_{2}^{5} \int_{3}^{5} (5 + \sin^{2}(yx^{2} + y^{3})) dy dx$  is between... (i) 0 and 10. (ii) 10 and 20. (iii) 20 and 30. (iv) 30 and 40.
  - (e) The Taylor series for  $f(x) = \frac{1}{2-x^2}$  centered at b = 0 converges on the interval... (i) (-1,1). (ii) (-2,2). (iii) (-4,4). (iv)  $(-\sqrt{2},\sqrt{2})$ .

2. (12 pts) Let L be the line of intersection of the two planes

x + y + 2z = c and x - cy - cz = -1

where c is some real number. Find a value of c for which L is perpendicular to the plane 3x - y - z = 0.

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3. (12 pts) Find the curvature of the ellipse

$$x = 3\cos(t), \quad y = 4\sin(t), \quad z = 1,$$

at the points (3, 0, 1) and (0, 4, 1).

4. (14 pts) Find and classify all the critical points of  $f(x, y) = 4xy - 3y + \frac{1}{x} - \frac{1}{4}\ln(y)$ . Clearly show your work in using the second derivative test and label your answers. 6. (12 pts) Compute

$$\iint\limits_R e^{-(x^2+y^2)} \, dA$$

where  $R = \{(x, y) : x^2 + y^2 \le 9\}.$ 

- 7. (12 pts) Let  $f(x) = 1 + x + x^2 + 3x^3$ .
  - (a) Find the second-degree Taylor polynomial,  $T_2(x)$ , for f(x) based at b = 1.

(b) Determine an interval around b = 1 on which

$$|T_2(x) - f(x)| < 0.024.$$

- 8. (14 pts) Let  $f(x) = \frac{x^3}{1+x^4}$ .
  - (a) Find the Taylor series for f(x) based at zero. Express your answer using sigma notation.

(b) Use the Taylor series you found in (a) to find the Taylor series for

$$g(x) = x^2 \ln(1 + x^4).$$

Express your answer using sigma notation.