Your Name

Your Signature

Student ID #

Quiz Section

Professor's Name

TA'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	12	
2	12	
3	12	
4	13	
5	12	

Problem	Total Points	Score
6	13	
7	13	
8	13	
Total	100	

1. [**4 points per part**] Parts (a)-(c) are unrelated.

   (a) Write parametric equations for the line of intersection of the planes

   $$2y + z + 4 = 0 \text{ and } 5y - z + 17 = 0.$$

   (b) Give the equation of the plane that contains the line $\mathbf{r}(t) = \langle 4t - 1, 2 - 5t, t \rangle$ and is perpendicular to the plane $x - y + 8z = 10$.

   (c) Give the equation of the plane with x-intercept 3, y-intercept 5, and z-intercept 8.

2. Parts (a) and (b) are unrelated.

   (a) **[5 points]** Find a vector function $\mathbf{r}(t)$ that gives the curve of intersection of the surfaces

   $$(x-2)^2 + z^2 = 9 \text{ and } y = 10z^2.$$

   (b) **[7 points]** The surface S consists of all points whose distance to the y-axis is three times the distance to the xz-plane. Find an equation for S and identify the surface.

   Choose from the following list (circle one):

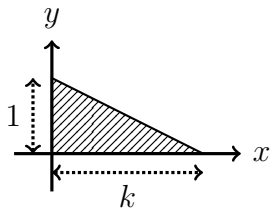
elliptic cylinder	parabolic cylinder	hyperbolic cylinder
paraboloid	ellipsoid	hyperbolic paraboloid
cone	hyperboloid of one sheet	hyperboloid of two sheets

3. **[12 points]** Find the equation of the tangent plane to the surface $z = \sqrt{x^2 + y^2}$ at $(3, 4, 5)$. Write your answer in the form $Ax + By + Cz = D$.

4. [**13 points**] Find and classify all critical points of

$$f(x,y) = x^4 \ + \ y^4 \ - 6x^2y^2 - 2x^2 \ + 2y^2 \ .$$

5. [**12 points**] Let T be the right triangle in the first quadrant of the xy-plane with legs along the x- and y-axes, with height 1 and base k. Here's a picture:



Let $\mathcal{S}$ be the solid above T and below the surface $z = xy$.

If the volume of $\mathcal{S}$ is 6, what's k?

6. [**13 points**] Find the volume of the solid in the first octant below the surface $z = 2 - e^{x^2+y^2}$ and above the xy-plane.

7. **[13 points]** For this problem, consider the function $f(x) = (1 + x)\sin(x)$.

   (a) Write $T_2(x)$, the second Taylor polynomial for f with base $b = 0$.

   (b) Find (and justify) an error bound for $|f(x) - T_2(x)|$ on the interval $[-0.01, 0.01]$.

8. **[13 points]** For this problem, consider the function $f(x) = \left(\dfrac{x}{1-x}\right)^2 = \dfrac{x^2}{(1-x)^2}$.

   (a) Write the Taylor series expansion for $f(x)$ with base $b = 0$.

   Give your final answer in Σ-notation using one sigma sign.

   (b) Find $f^{(100)}(0)$.