Your Name

Your Signature

Student ID #

Quiz Section

Professor's Name

TA's Name

- CHECK that your exam contains 8 problems on 6 double-sided pages, including this cover sheet. There is one blank page at the front and two blank pages at the back reserved for scratch work or extra space.
- This exam is closed book. You may use one $8\frac{1}{2}$" × 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 back of the first page or either side of the last page **and indicate that you have done so**. If you *still* need more room, ask for more scratch paper.
- **Do not write within 1 centimeter of the edge of the page.**
- Raise your hand if you have a question.

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

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

You may use this page for scratch-work.

All work on this page will be ignored unless you write & circle "see first page" below a problem.

1. *(12 points)* Find the equation for the plane that passes through the point $(1, 2, 4)$ and contains the line given by $x = 2t$, $y = 3 - t$, $z = 2 + 5t$. And give the x-intercept of this plane.

Plane Equation: ______________________

x-intercept: $(x, y, z) =$ ______________________

2. *(12 points)* Let a curve γ be the intersection of the plane $y+z=1$ and the cylinder $x^2+y^2=1$. Find the points where γ has maximum curvature.

Points: $(x, y, z) =$ ______________________________

3. *(6 points per part)* Parts (a) and (b), consider the surface implicitly defined by the equation

$$z(\cos(z) + 2) = x^2 - y^2.$$

(a) Find $\dfrac{\partial z}{\partial x}$ and $\dfrac{\partial z}{\partial y}$.

$\dfrac{\partial z}{\partial x} =$ ______________________________

$\dfrac{\partial z}{\partial y} =$ ______________________________

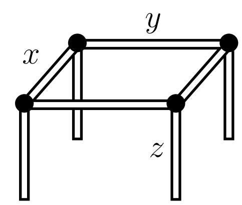
(b) Give the linear approximation, i.e. tangent plane, to the surface at the point where $(x, y) = (1, 1)$. And use this approximation to estimate the z-coordinate of a point on the surface where $(x, y) = (1.01, 0.98)$.

Linearization: ____

$z \approx$ ____________________

4. *(12 points)* Find the dimensions of a rectangular tent of maximum volume such that the sum of the lengths of its 8 posts (above the ground) is 36 m.

   To receive full credit, you must justify that your answer is indeed the maximum.



Dimensions: ______________________________

5. *(6 points per part)* For the following problems, set up an iterated integral as described.

You do not have to evaluate the integrals. Just set them up.

(a) Reverse the order of integration of $\int_0^2 \int_{2^{(3-x)}}^{8-3x} \sin(x^2)\, dy\, dx$.

Integral: ______________________________

(b) Write a double integral for the volume below the cone $z = \sqrt{x^2 + y^2}$ and above the paraboloid $z = x^2 - x + y^2$.

(Hint: convert to polar!)

Integral: ______________________________

6. *(12 points)* Let $\mathcal{L}$ be the lamina whose shape is the triangular region with vertices $(0, 0)$, $(0, 2)$, and $(1, 2)$, and whose density at any point is proportional to its distance to the y-axis.

   Find the center of mass of $\mathcal{L}$.

$(\overline{x}, \overline{y}) =$ ______________________________

7. For this problem, let $g(x) = (3+x)^{3/2}$ and consider the Taylor polynomials based at $b = 1$.

   (a) *(5 points)* Find the second Taylor polynomial, $T_2(x)$, for the function g based at $b = 1$.

   $T_2(x) =$ ______________________________

   (b) *(4 points)* Use $T_2(x)$ to approximate the value of $\sqrt{4.4^3}$

   $\sqrt{4.4^3} \approx$ ______________________________

   (c) *(5 points)* Use Taylor's inequality to find an upper bound for the error in your approximation in part (b).

   Upper bound: ______________________________

8. For this problem, let $f(x) = \dfrac{16}{4 - x^2} + 6\cos(2x)$

   (a) *(6 points)* Give the Taylor series for f based at $b = 0$ using one sigma sign.

   Taylor series: ______________________________

   (b) *(3 points)* Find the largest open interval on which this Taylor series converges.

   interval: ______________________________

   (c) *(5 points)* Find $T_3(x)$, the third Taylor polynomial for f based at $b = 0$, then estimate the value of $\int_0^1 f(x)\,dx$ by replacing $f(x)$ with $T_3(x)$.

   $\int_0^1 f(x)\,dx \approx$ ______________________________

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