Your Name

Your Signature

Student ID #

Quiz Section

Professor's Name

TA's Name

- This exam contains 9 problems. CHECK THAT YOU HAVE A COMPLETE EXAM.
- This exam is closed book. You may use one $8\frac{1}{2} \times 11$ sheet of notes and a non-graphing, scientific calculator. Do not share notes or calculators.
- Give your answers in exact form. Do not give decimal approximations.
- In order to receive credit, you must show 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.
- Raise your hand if you have a question.

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

Problem	Total Points	Score
6	10	
7	12	
8	12	
9	12	
Total	100	

1. (10 points) Find parametric equations of the line of intersection of the planes

$$-x + y + 4z = 7 \text{ and } x - 3y + 2z = 15.$$

2. (10 points) Let a be a positive real number.

   (a) Find the curvature of the vector function

   $$\vec{r}(t) = \langle 2\cos t, a\sin t, t\rangle$$

   at $t = \pi$. Simplify as much as possible.

   (b) Find the positive value of a for which $\vec{r}(t)$ has curvature $\dfrac{1}{41}$ at $t = \pi$.

3. (12 points)

   (a) Find the equation of the tangent plane to the surface $z = x^2y + e^y - \frac{y}{x}$ at the point $(1, 0, 1)$.

   (b) Find all points (x_0, y_0, z_0) on the surface $z = x^3y^2$ at which the tangent plane is parallel to the plane $3x + 18y - z = 0$.

4. (10 points) Suppose x, y, and z are positive numbers. What is the minimum possible value of

$$S = x + 2y + 3z$$

if $xyz = 100$? (Include in your solution some verification that your answer is the minimum.)

5. (12 points)

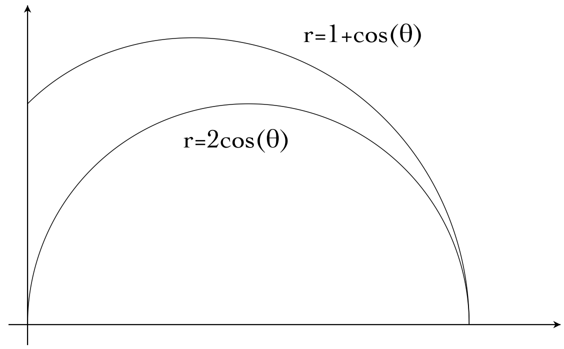
(a) Let R be the region in the first quadrant bounded by $y = 5 - 4x^2$ and $y = x^2$. Evaluate the integral

$$\iint_R xy\, dA$$

(b) Evaluate the integral:

$$\int_0^3 \int_{y^2}^9 y e^{x^2}\, dx\, dy$$

6. (10 points) Find the area of the region in the first quadrant inside the cardioid $r = 1 + \cos\theta$ and outside the circle $r = 2\cos\theta$.



7. (12 points) Let $f(x) = e^{2x-4}$.

   (a) Give the third Taylor polynomial $T_3(x)$ for $f(x)$ based at $b = 2$.

   (b) Use Taylor's Inequality to bound the error $|f(x) - T_3(x)|$ on the interval $I = [1, 3]$.

8. (12 points)

   (a) Find the Taylor series for $\cos(2x^3)$ based at $b = 0$. Write your answer in sigma notation.

   (b) Use the first three nonzero terms of the Taylor series in part (a), to approximate the value of the integral
   $\int_0^1 \cos(2x^3)\,dx$. (Give your final answer to four digits after the decimal point).

9. (12 points)

(a) Find the Taylor series for $f(x) = \dfrac{1}{1+4x} - \dfrac{1}{6x-3}$ based at $b = 0$. Write your final answer using one sigma sign.

(b) Give the first three non-zero terms of the Taylor series from part (a).

(c) Give an interval I where the Taylor series from part (a) converges. (Show your work)