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 $8\frac{1}{2}$" $\times$ 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 $\boxed{\text{YOUR FINAL ANSWER}}$ 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. *(6 points per part)*

12.5

(a) Find parametric equations for the line of intersection of the planes $2x - y + 3z + 4 = 0$ and $-x + y - z = 0$.

Parametric equations: _____

(b) Find the intersection point of the line you found in part (a) with the plane $x+2y+z = 12$.

Intersection point: $(x, y, z) =$ _____

2. *(4 points per part)* Consider the curve given by the position function $\mathbf{r}_1(t) = \langle \ln(t), t^2 + 5, 3t \rangle$ for $t > 0$.

13.3

(a) Find the curvature at $t = 1$.

(a) 13.3

(b) 13.2

$\kappa(1) =$ _____

(b) Find the (x, y, z) point on the curve at which the tangent line is orthogonal to the plane $x + 8y + 6z = 7$.

(c) 13.2

$(x, y, z) =$ _____

(c) Find the **acute** angle of intersection of $\mathbf{r}_1(t)$ with the curve $\mathbf{r}_2(u) = \langle 0, u^3 - u, \sqrt{u^2 + 5} \rangle$.

(Give your answer rounded to the nearest degree.)

Angle $\approx$ _____ degrees

3. *(6 points per part)* Consider the function $f(x, y) = x^2 + xy^2 - y$.

14.7

(a) Find all the saddle point(s) of f in $\mathbb{R}^2$. Justify your answer.

Saddle point(s): _____

(b) Let D be the closed region bounded by $x = y^2$ and $x = 1$. Find the absolute maximum and absolute minimum values of the function f on the region D, and the points where these extrema occur.

Absolute (global) maximum on D: $f($____, ____$) =$ _____

Absolute (global) minimum on D: $f($____, ____$) =$ _____

4. (*12 points*) Consider the surface $x^2 - (y+1)^2 - 3z^2 = 2$.

   Find the point(s) on the surface that are closest to the point $A(0, 3, 1)$.

   For full credit, you must show work to justify your answer.

14.7

Closest point(s): _____

5. *(6 points per part)* The parts of this question are not related.

(a) The region D is bounded above by the curve $y = \frac{1}{x}$, below by the line $y = \frac{1}{2}(x - 1)$ and to left by the line $x = 1$.

NO LONGER COVERED IN MATH 126

Chapter 15 material - covered in Math 224

n.

You may have to split the region.

ne way: _____

Another way: _____

(b) Evaluate $\int_0^1 \int_{y^4}^{\sqrt{y}} \left(\quad - y^2 \right) \, dx \, dy$.

Answer: _____

6. *(12 points)* Find the volume of the region that is inside the ellipsoid $x^2 + y^2 + 4z^2 = 25$ and above the cone $z = \sqrt{x^2 + y^2}$.

NO LONGER COVERED IN MATH 126

Chapter 15 material - covered in Math 224

Volume = _____

7. Let $f(x) = \sqrt{(2x+1)^3}$.

   (a) *(6 points)* Find the second Taylor polynomial $T_2(x)$ for f based at $b = 4$.

11.11 - Taylor polynomials

Note: Taylor series emphasis changed in Autumn 2026.
Use current homework to determine what to study.

$T_2(x) =$ _____

   (b) *(3 points)* Use your answer to part (a) to approximate $\sqrt{9.1^3}$.

$\sqrt{9.1^3} \approx$ _____

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

Upper bound: _____

8. For this problem, let $f(x) = x\sin(x^4) + \dfrac{x^2}{4 - x^3}$.

   (a) *(6 points)* Find $T_{10}(x)$, the 10th Taylor polynomial for f based at $b = 0$.

11.10-11.11

Note: Taylor series emphasis changed in Autumn 2026.
Use current homework to determine what to study.

$T_{10}(x) =$ _____

   (b) *(3 points)* Find the largest open interval on which the Taylor series for f based at $b = 0$ converges.

Interval: _____

   (c) *(5 points)* Find $f^{2024}(0)$. (That is, the 2024th derivative of f at 0.) Give an exact answer.

$f^{(2024)}(0) =$ _____

You may use this page for scratch-work.

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

You may use this page for scratch-work.

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