

MATH 2200 Exam 3

Instructor: Dr. Shuzhou Wang

Print Your Name:

UGA Student Honor Code: “I will be academically honest in all of my academic work and will not tolerate academic dishonesty of others.”

Sign Your Name:

Without your signature, your paper will not be graded.

UGA Academic Honesty Policy applies. **No Calculators.** Closed Book. *Show work, otherwise no credit will be given.* You lose points for giving confusing arguments. Cross out the parts you do not want to be graded. The last problem is optional. The rest problems are worth 100 points (i.e. 100%).

Problem #	Points	Score
1	35	
2	20	
3	20	
4	25	
bonus	15	
Total	115	

1. (35 points, 10 each for (c), (e), rest 5 each. Simplify answers for (c) and (e) only):

(a) $y = e^{x^3} \sin^2 2x$, find $\frac{dy}{dx}$

(b) $y = (x^2 + 1)^{\ln x}$, find $\frac{dy}{dx}$

(c) Find the equation of the tangent at the point $(1, -2)$ of the curve $x^2y + y^2x = 2$.

(d) $y = x^3 e^{2x}$, find dy in terms of dx and x .

(e) Use the method of linear approximation to estimate the number $\sqrt[5]{100005}$.

2. (20 points) A man 6 ft tall walks with a speed of 8 ft/s away from a street light that is atop an 18-ft pole. How fast is the tip of his shadow moving along the ground when he is 100 ft from the light pole?

3. (20 points) Let $f(x) = x^3 - 3x + 5$. Find the critical points of $f(x)$ and classify them as local minima or maxima, or not extrema, and determine if they are global extrema, also find the intervals on the x -axis on which $f(x)$ is increasing and those on which $f(x)$ is decreasing.

4. (25 points) You need a tin can in the shape of a right circular cylinder of volume $54\pi \text{ cm}^3$. What radius r and height h would minimize its total surface area (including top and bottom)? i.e. Find the dimensions that minimizes the total amount of material to be used. Be sure to justify your answer. Note: $54 = 2 \times 3^3$

5. * (15 bonus points) (Note: This **Optional** problem will be graded strictly.)

A rectangular poster is to have printed part in a rectangular space in the center with a 6 inch border at the top and bottom and a 4 inch border on each side. The area of the printed part must be 384 square inches. Find the dimensions of the poster that needs least amount of material. Be sure to justify your answer. (Use $384 = 2^7 \cdot 3$)