

Mathematics 221, Lecture 2
Instructor: L. Maxim

Name: _____
TA's Name: _____

PRACTICE FINAL EXAM

Do all eight of the following problems. Show all your work, and write neatly.

No.	Points		Score
1	25		
2	25		
3	25		
4	25		
5	25		
6	25		
7	25		
8	25		
	200	TOTAL POINTS	

Problem I (25 points)

Find the equation of the tangent line to the curve $x^3 + y^3 = 9xy$ at the point $(x, y) = (2, 4)$.

Problem II (25 points)

Use logarithmic differentiation to calculate the derivative $\frac{dy}{dx}$ of

$$y = (\ln x)^{\ln x}.$$

Problem III (25 points) Evaluate the following limits:.

a) $\lim_{x \rightarrow \infty} (\ln x)^{1/x}$

b) $\lim_{x \rightarrow 0} \frac{10^x - 1}{x}$

c) $\lim_{x \rightarrow 0} \frac{4 - 4e^x}{xe^x}$

Problem IV (25 points)

Find the volume of the solid obtained by revolving the region bounded by $y = \sqrt{x}$, $y = 2$, $x = 0$ about the line $x = 4$.

Problem V (25 points)

Find the total area of the region between the curves $y = \cos x$ and $y = \sin x$ for $0 \leq x \leq 3\pi/2$.

Problem VI (25 points) Evaluate the following integrals:

a) $\int e^x \sin(e^x) dx$

b) $\int_1^8 \left(\frac{2}{3x} - \frac{8}{x^2} \right) dx$

c) $\int_2^4 (1 + \ln t)t \ln t dt$

Problem VII (25 points)

The sum of two nonnegative numbers is 36. Find the numbers if the difference of their square roots is to be as large as possible.

Problem VIII (25 points)

Find the center of mass of a thin plate of constant density δ covering the region bounded by the parabola $y = 25 - x^2$ and the x -axis.