Name______________________

T.A. name______________________

Section time________

Mathematics 16B
R. Hartshorne
Hour Exam
Wednesday, 9/25/96

(The test is on both sides of this page.)

Do not write here.

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Part I. *Show your work and put your answers in the box. 5 points each. No partial credit.*

1. $f(x,y) = \dfrac{x}{1+e^y}$. Find $\dfrac{\partial f}{\partial y}$.

2. $f(x,y) = x^3y + 2xy^2$. Find $\dfrac{\partial^2 f}{\partial x \partial y}$.

3. $f(x,y) = \dfrac{2x-3y}{2x+3y}$. Find $\dfrac{\partial f}{\partial x}$ and simplify.

4. $f(x,y) = \ln(x^2y^3)$. Find $\dfrac{\partial f}{\partial y}$ and simplify.

5. Convert to radian measure: 990°. Express your answer as a rational multiple of π.

6. Find a value of t with $-\pi/2 \leq t \leq \pi/2$ for which $\sin t = \sin 7\pi/6$.

7. Find $\cos(-5\pi/6)$. Express your answer using rational numbers and square roots. (Do not give a decimal.)

8. Simplify $\dfrac{(\sin t \cos t \tan t) - 1}{(\sin t \tan t \sec t) + 1}$.

9. Find $\int \sec^2 3t\,dt$.

10. If $y = \ln(\cos x)$, find $\dfrac{dy}{dx}$.

Part II. *10 points each. Show your work. Put answers in boxes.*

1. $f(x,y) = x^3 - y^2 - 3x + 4y$. Find all points at which the function has a possible maximum or minimum. Use the second derivative test to determine the nature of each critical point.

2. Using the methods of Lagrange multipliers, find two positive numbers x and y so that $x^2y = 108$ and $x + y$ is as small as possible.

3. Find the equation of the straight line which best fits the points (1,0), (2,–1), (3,–4), in the sense of least squares.

4. Find the maximum value of the function $y = 3\sin x + \cos x$ in the interval $0 \leq x \leq \pi$. Express your answer using rational numbers and square roots.

5. Find the area under the curve $y = t + \sin t$ between the values $t = 0$ and $t = \pi$. Express your answer using rational numbers and π.