Math 16B
R Hartshorne
Oct 3, '03

Name _____
TA's name _____
Section time _____

Midterm Exam

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(Do not write in box ↑)

Part I. 8 questions, 5 points each.
Show your work. Put answers in boxes.
No partial credit.

Answers ↓

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

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

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

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

5. Convert 990° to radian measure. Express your answer as a rational number $\times \pi$.

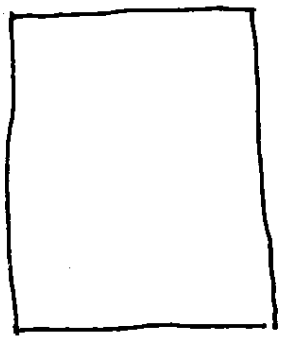
6. Find $\cos\left(-\frac{5\pi}{6}\right)$. Express your answer using rational numbers and square roots. (no decimals).

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

8. If $y = \ln|\cos x|$, find $\frac{dy}{dx}$.

Part II. Longer questions. 4 questions, 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 may have a maximum or minimum. For each of those points, apply the second derivative test to determine the behavior of the function.



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

3. 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.

4. Find the area of the function $y = t + \sin t$ between the t-axis and the curve, for $0 \leq t \leq \pi$. Express your answer using rational numbers and π.