Math 225: Calculus III Name:_____

Exam II *March 23, 1995* Section:_____

Record your answers to the multiple choice problems by placing an $\times$ through one letter for each problem on this answer sheet. There are 15 multiple choice questions worth 6 points each. You start with 10 points.

The force of gravity on a spacecraft located at (x, y, z) is $F(x, y, z) = 3125/(x^2 + y^2 + z^2)$. Suppose the spacecraft's position and velocity at time $t = 1$ are $= 9 \supset +12$ and $\doteq 10 \subset -12 \supset +90$, respectively. Find $\frac{dF}{dt}$ at time $t = 1$.

-120 0 $(0, -10/9, -40/27)$ $(-0.001, -0.001, -0.008)$ -0.107

Let $f(x, y, z) = x^2y - y^2z$. Compute the derivative of f at the point $(1, 2, 0)$ in the direction $4 \subset +3$. $4/5$ 4 $4/\sqrt{33}$ 2 $4/\sqrt{14}$

Let $f(x, y, z) = e^{-yz}\cos(xy)$. Compute (f) at the point $(\pi, 1, 0)$. $-\ \supset -\supset$

Determine the equation of the plane tangent to the ellipsoid

$$x^2 + 2y^2 + 3z^2 = 20$$

at the point $(3, 2, 1)$ $3x + 4y + 3z = 20$ $2x + 4y + 6z = 0$ $2(x - 3) + 4(y - 2) + 6(z - 1) = 0$ $3x + 4y + 3z = 0$ $2x(x - 3) + 4y(y - 2) + 6z(z - 1) = 0$

Find the critical points of the function $f(x, y) = 2x^3y - 6xy + 3y^2$. $(0, 0), (1, 2/3), (-1, -2/3), (\sqrt{3}, 0), (-\sqrt{3}, 0)$ $(0, 0), (1, 2/3), (-1, 2/3), (1, -2/3), (-1, -2/3)$ $(1, 2/3), (-1, 2/3), (1, -2/3), (-1, -2/3)$ $(0, 0), (\sqrt{3}, 0), (-\sqrt{3}, 0)$ $(0, 0), (1, 2/3), (-1, 2/3), (1, -2/3), (-1, -2/3), (\sqrt{3}, 0), (-\sqrt{3}, 0)$

Choose the statement below that applies to the function

$$f(x, y) = x^3y - xy^2 + 2xy$$

f has a critical point at $(\sqrt{2}, 0)$ f has a local maximum at $(0, 0)$ f has a local minimum at $(0, 0)$ f has a saddle point at $(0, 2)$ *none of the above*

Find the maximum value of the function $f(x, y) = (1 - y^2)\log(1 + x^2)$ on the rectangle $-1 \le x \le 1$, $-1 \le y \le 1$. 0.693 0.285 1.176 0.104 0.922

Find the extreme values of the function $f(x, y) = 1 + x^2y$ on the unit circle $x^2 + y^2 = 1$. 1.385 and 0.615 1.570 and 0.301 1.125 and 0.978 1.404 and 0.839 1.829 and 0.532

Let R be the region between the x-axis and $y = x$ for $0 \le x \le 1$. Compute $_R 6ye^{x^3}\,dA$. 1.718 1.415 2.843 0.286 1.031

Reverse the order of integration of the integral

$$\int_1^5 \int_{\sqrt{y-1}}^2 f(x, y)\,dx\,dy$$

$\int_0^2 \int_1^{1+x^2} f(x, y)\,dy\,dx$ $\int_{\sqrt{y-1}}^2 \int_1^5 f(x, y)\,dy\,dx$ $\int_0^1 \int_2^{1+x^2} f(x, y)\,dy\,dx$ $\int_0^{\sqrt{y-1}} \int_1^2 f(x, y)\,dy\,dx$ $\int_1^2 \int_{1+x^2}^5 f(x, y)\,dy\,dx$

Find the area of the region inside the cardiod $r = 1 + \sin(\theta)$ in the first quadrant.

$1 + \frac{3\pi}{8}$ $1 + \frac{\pi}{2}$ $1 + \frac{\pi}{4}$ $1 + \frac{3\pi}{4}$ $1 + \frac{\pi}{8}$

Compute the volume of the solid region under the graph of $f(x, y) = 4 - x^2 - y^2$ over the triangular region defined by $x + y \leq 1$ in the first quadrant.

11/6 4/3 17/12 5/2 9/4

Find the average value of the function $f(x, y) = y \sin(xy)$ over the region $0 \leq x \leq \sqrt{\pi}$, $0 \leq y \leq \sqrt{\pi}$. $\frac{1}{\sqrt{\pi}}$ $\frac{1}{\pi\sqrt{\pi}}$ 0 $\sqrt{\pi}$ $\pi\sqrt{\pi}$

Suppose z is a function of u and v and that $u = x^2 - y^2$ and $v = \log(x - y)$. If $z_u(3, 0) = -3$ and $z_v(3, 0) = 5$, compute z/dx when $x = 2$ and $y = 1$. -7 28 -1 -23 8

Choose the function below that has the following graph.

$f(x, y) = y^2 + x^2y - y$ $f(x, y) = y^2 + x^2$ $f(x, y) = x - y^2 - x^2$ $f(x, y) = y^2 + 2xy - x$ $f(x, y) = y^2 - x^2y$