Math 225: Calculus III Name:________________________________

Exam II *March 17, 1994* 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 14 multiple choice questions worth 6 points each. You start with 16 points.

Find the limit $\lim_{(x,y)\to(0,0)} \left(\frac{x^2-y^2}{x^2+y^2}\right)^2$. *does not exist* 0 1 4 2

Let $f(x,y) = \cos(x^2y)$. Compute $f_{xy}(2,\pi)$. -16π 8π -4π π 0

A triangular sheet of glass is expanding. When the base is 2 inches and the height is 4 inches, the base is increasing at the rate of 0.25 in/hr and the height at 0.5 in/hr. At what rate is the area of the triangle increasing? 1.0 in^2/hr 0.75 in^2/hr 1.5 in^2/hr 1.75 in^2/hr 2.0 in^2/hr

Suppose that z is a function of u and v, and that $u = e^{xy}$ and $v = \frac{x}{y}$. If $z_u(e,1) = 3$ and $z_v(e,1) = 1$, find z/dy when $x = 1$ and $y = 1$. $3e - 1$ 1 0 $e - 3$ $-e$

Which of the following represents the graph of the function $f(x,y) = 12y - y^3 - 3x^2$?

Compute the derivative of $f(x,y) = x^2y - y^2 - 2$ in the direction $3 \subset +4 \supset$ at the point $(2,1)$. 4 $12 \subset +8 \supset$ $4 \subset +2 \supset$ 20 *does not exist*

Find the direction in which the function $f(x,y) = x^3 - 3xy^2$ increases most rapidly at the point $(1,-1)$. $\supset \subset 3x^2 \subset -2xy \supset (x^2 - y) \subset -x \supset 2 \subset - \supset$

Determine the equation of the plane tangent to the paraboloid $z = 9 - 4x^2 - y^2$ at the point $(1,1,4)$. $8x + 2y + z = 14$ $x + y + 4z = 18$ $4x + 2y + z = 10$ $x + 8y + 4z = 25$ $x + 4y + z = 9$

Determine the critical points of the function $f(x,y) = 3x^2 - 3xy^2 + 2y^3$. $(0,0)$, $(2,2)$ $(0,0)$, $(2,0)$, $(2,2)$ $(0,0)$, $(2,0)$ $(0,0)$, $(2,2)$, $(-2,2)$ $(0,0)$, $(2,0)$, $(2,2)$, $(-2,2)$

The function $f(x,y) = 2x^3 - 6x + 2y^3 - 3xy^2$ has a critical point at $(\sqrt{2},\sqrt{2})$. Use the Second Partials Test to determine which of the following is true at this point: *f has a relative minimum* *f has a relative maximum* *f has a saddle point* *test is inconclusive* *none of the above*

Find the maximum of the function $f(x,y) = y^3 + 3x^2y$ in the region $x^2 + y^2 \le 4$. $8\sqrt{2}$ 8 0 16 $16\sqrt{2}$

Determine which of the following sets of equations must be solved to find the extreme values of the function $f(x,y) = x^3y + y^2x + xy^4$ subject to the constraint $x^4 + 4xy + y^4 = 4$. $3x^2y + y^2 + y^4 = \lambda(4x^3 + 4y)$
$x^3 + 2xy + 4xy^3 = \lambda(4x + 4y^3)$
$x^4 + 4xy + y^4 = 4$

$3x^2y + y^2 + y^4 = \lambda(4x^3 + 4y^3)$
$x^3 + 2xy + 4xy^3 = \lambda(4x^3 + 4y^3)$
$4x^3 + 4y + 4y^3 = 0$

$3x^2y + y^2 + y^4 = \lambda(4x^3 + 4y + 4y^3)$
$3x^2 + 2y + 4y^3 = \lambda(4x + 4y^3)$
$x^4 + 4xy + y^4 = 4$

$3x^2y + y^2 + y^4 = \lambda(4x^3 + 4y^3)$
$x^3 + 2xy + 4xy^3 = \lambda(4x^3 + 4y^3)$

$3x^2y + y^2 + y^4 = \lambda(4x$
$x^3 + 2xy + 4xy^3 = \lambda(x$

Let R be the triangle in the plane with vertices at the points $(0,0)$, $(0,1)$, and $(1,1)$. Compute the double integral ${}_R x + y^2\, dA$. $\frac{5}{12}$ $\frac{6}{15}$ $\frac{1}{4}$ $\frac{1}{3}$ $\frac{2}{5}$

Reverse the order of integration of the iterated integral $\int_0^1 \int_{\sqrt{y}}^1 f(x,y)$. $\int_0^1 \int_0^{x^2} f(x,y)$ $\int_1^{\sqrt{x}} \int_0^1 f(x,y)$ $\int_0^1 \int_{\sqrt{x}}^1 f(x,y)$ $\int_{\sqrt{y}}^1 \int_0^1 f(x,y)$ $\int_0^1 \int_{x^2}^1 f(x,y)$

Find the centroid of the region between the y-axis and $x = 1 - y^4$. $(\frac{4}{9}, 0)$ $(\frac{32}{45}, 0)$ $(\frac{5}{8}, 0)$ $(\frac{3}{8}, 0)$ $(\frac{4}{5}, 0)$