Second Midterm Exam MAT 205, Fall 2000

PRINT your name:

problem	1	2	3	4	5	6	7	8	Total
possible	8	8	15	10	16	13	15	15	100
score									

Directions: There are 8 problems on 5 pages in this exam. Make sure that you have them all. Do all of your work in this exam booklet, and cross out any work that the grader should ignore. You may use the backs of pages, but indicate what is where if you expect someone to look at it. Books, extra papers, and discussions with friends are not permitted. You may use a calculator, provided it does not do calculus.

1.*(8 points)* If $f(x,y) = xe^{2y}$, then $f_x(2,1) =$ __________ and $f_y(2,1) =$ __________.

2.*(8 points)* Compute $\nabla xy\sin(x^2+y^2)$.

3.*(10 points)* Compute the derivative of x/y at the point $(6,-2)$ in the direction of $\langle -2, 1\rangle$.

4. *(15 points)* **a.** Write the equation of the plane tangent to the surface $x^2\sqrt{y^2+5}$ at $(1, 2, 3)$.

b. What is the direction in which the surface rises most quickly from $x = 1, y = 2$?

5. *(13 points)* Let $R(t) = \left\langle t,\ \dfrac{4t^{3/2}}{3},\ t^2 \right\rangle$. Find the length of the curve between the points $(1, \frac{4}{3}, 1)$ and $(2, \frac{8\sqrt{2}}{3}, 4)$.

6. *(16 points)* Let $f(x, y) = x^3 - 6xy - 6y^2$.

a. Find all of the critical points of f.

b. List all relative maxima of f. If there are none, write "none". Justify your answer.

c. List all relative minima of f, if any. If there are none, write "none". Justify your answer.

7.*(15 points)* Agent Orange has been trapped by Dr. E. Ville in the Amazing World of Temperatures ride at Big Whoop amusement park. There is a blazing sun at the top center of the ride, and the temperature goes up by 20° for each meter the car rises. However, two of the walls are glacial, and temperatures drop 2°/meter as the car moves towards either of them (i.e. as x or y increase). If the CookMobile™ is spiraling upwards and outward, with its position given by

$$x = t\sin(\pi t), \quad y = t\cos(\pi t), \quad z = \sqrt{t},$$

at what rate is the temperature in the car changing at $t = 4$ seconds? Is it getting hotter or colder?

8. *(15 points)* Below are five parametric equations, and six graphs. After each equation, write the roman numeral of its graph. All have the domain $0 \le u \le 2\pi, \quad 0 \le t \le 2\pi$.

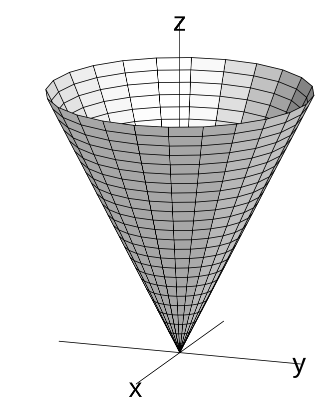
a. $x = \sin u \cos t \quad y = \sin u \sin t \quad z = \sqrt{u}$ Graph is ______

b. $x = \cos u \quad y = \sin u \quad z = t/4$ Graph is ______

c. $x = \frac{t}{2} \cos t \quad y = \frac{t}{2} \sin t \quad z = u\sqrt{t} + t$ Graph is ______

d. $x = \frac{u}{2} \cos t \quad y = \frac{u}{2} \sin t \quad z = u$ Graph is ______

e. $x = \frac{u}{2} \cos t \quad y = \frac{u}{2} \sin t \quad z = t$ Graph is ______



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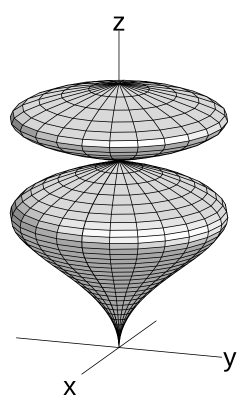

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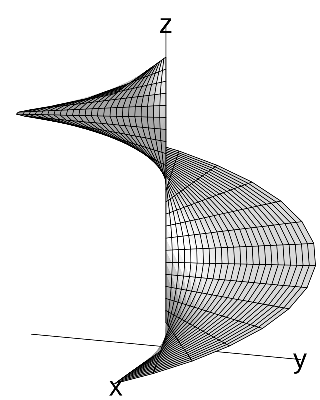

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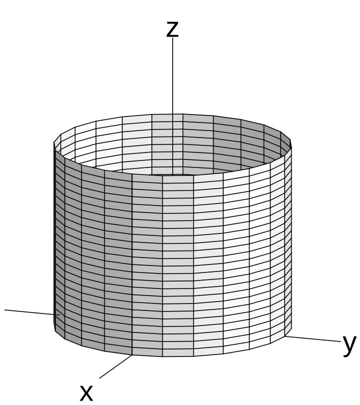

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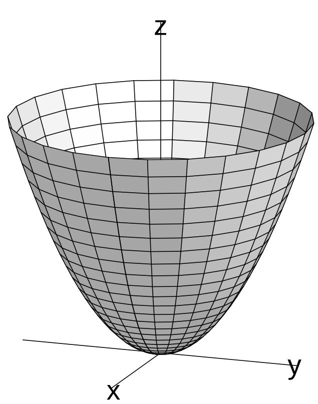

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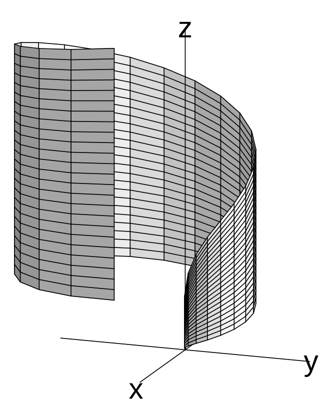

VI