

VCU  
MATH 307  
MULTIVARIATE CALCULUS

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TEST 2



October 11, 2013

GOOD LUCK!

Name: \_\_\_\_\_

Score: \_\_\_\_\_

**Directions.** Solve the following questions in the space provided. Unless noted otherwise, you must show your work to receive full credit. This is a closed-book, closed-notes test. Calculators, computers, etc., are not used. Put a your final answer in a  box, where appropriate.

1. (30 pts.) Consider function  $z = f(x, y) = \ln(x^2 + y^2)$ .

(a) State the domain of  $f$ .

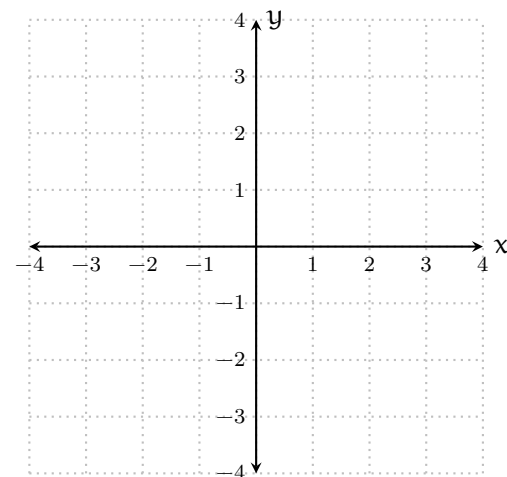
(b) State the range of  $f$ .

(d)  $f\left(0, \frac{1}{e}\right) =$

(d) Sketch the level curve for  $z = \ln(4)$ .

(e)  $\nabla f(x, y) =$

(f) Find the rate of change of  $f(x, y)$  in the direction of  $\langle 5, 5 \rangle$  at the point  $(1, 3)$ .



2. (24 pts.) Evaluate each limit, if possible; if not, explain why it does not exist.

(a) 
$$\lim_{(x,y) \rightarrow (0,0)} \frac{x-y}{x+y}$$

(b) 
$$\lim_{(x,y) \rightarrow (1,1)} \frac{xy - y - 2x + 2}{x - 1}$$

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3. (20 pts.) Consider the function  $f(x, y) = e^{4x - x^2 - y^2}$ . Find all local maxima, local minima and/or saddle points.

4. (16 pts.) Consider  $f(x, y) = \ln(xy) \tan^{-1}(x)$ .

(a)  $\frac{\partial f}{\partial x} =$

(b)  $\frac{\partial f}{\partial y} =$

(c)  $\frac{\partial^2 f}{\partial y \partial x} =$

(d)  $f_x(1, 1) =$

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5. (10 pts.) Sketch the domain of

$$f(x, y) = \frac{\sqrt{1-x+y}}{x+2}.$$

