

This exam is worth 100 points and has 5 questions.

**Show all work and simplify your answers!** Answers with no justification will receive no points unless otherwise noted.

**Please begin each problem on a new page.**

**DO NOT** leave the exam until you have satisfactorily scanned and uploaded your exam to Gradescope.

You are taking this exam in a proctored and honor code enforced environment. **NO** calculators, cell phones, or other electronic devices or the internet are permitted. You are allowed one 8.5" x 11" crib sheet with writing on one side.

0. At the top of the first page that you will be scanning and uploading to Gradescope, write the following statement and sign your name to it: "I will abide by the CU Boulder Honor Code on this exam." **FAILURE TO INCLUDE THIS STATEMENT AND YOUR SIGNATURE MAY RESULT IN A PENALTY.**

1. [2350/101922 (10 pts)] Write the word **TRUE** or **FALSE** as appropriate. No work need be shown. No partial credit given.

(a) The tangent plane to the surface  $z = x^2 + 2xy + 2y^2 - 6x + 8y$  at the point  $(10; 7)$  is horizontal.

(b) There is no real value of  $k$  that makes the function  $f(x; y) = \begin{cases} \frac{2x^2y}{x^3 + y^3} & (x; y) \notin (0; 0) \\ k & (x; y) = (0; 0) \end{cases}$  continuous on its domain.

(c) If  $f(x; y) = e^{x^2+3y}$ ,  $x = \frac{\rho}{2} \cos u \sin 2v$ ;  $y = \frac{\rho}{2} \sin 4u \cos v$ , then  $\frac{\partial f}{\partial u} = 10e$  when  $u = v = \frac{\pi}{4}$ .

(d) The curve in the  $xy$ -plane corresponding to all points on the surface  $f(x; y) = x^2 - 2x + 4y^2 + 4$  that are 19 units above the  $xy$ -plane is a hyperbola.

(e) The instantaneous rate of change of  $z$  with respect to  $y$  at the point  $(1; 0; 1)$ , where  $xz^3 + y^2 \ln z + e^x \cos y + 3xyz = 1$ , is 1.

2. [2350/101922 (21 pts)] The centripetal acceleration ( $m/s^2$ ) of a particle moving in a circle is  $a(r; v) = v^2/r$ , where  $v$  is the velocity (m/s) and  $r$  is the radius (m) of the circle.

(a) (10 pts) Suppose you measure the radius to be roughly 2