Instructions: Do no more than one problem per page. You may use any calculator or the computer at your station (MAPLE only AND NO PREVIOUSLY PREPARED MATERIAL in any format); however, you must show enough work and steps on your paper to convince me that you actually worked the problem on your own to receive any credit whatsoever. Circle important sub-results, and box your final answers. As always, leave a 1 in. margin at the top and left side of each page, and do not write on the back of any page. You must turn in all sheets of paper, even scratch paper!

#6 // Show, by letting \((x, y) \rightarrow (0, 0)\) along two different paths, that \(\lim_{(x,y) \to (0,0)} \frac{xy^4}{x^2 + y^8}\) does not exist (DNE). [[ Hint: let one path be a straight line – pick an easy one – and let the other path be a “root” function – not the square root! ]]

#7 // Find all second partial derivatives. \(z = y \tan 2x\)

#8 // A. State the linearization formula. B. Find the linearization \(L(x, y)\) of \(f(x, y) = \frac{x}{y}\) at \((6, 3)\). Simplify your answer.

#9 // Use the formula \(\frac{dy}{dx} = -\frac{F_x}{F_y}\) to find \(\frac{dy}{dx}\) if \(\sin x + \cos y = \sin x \cos y\). There’s a little, but not much, simplification that you can do to your answer.

#10 // Find the directional derivative of \(f(x, y, z) = \left(x + 2y + 3z\right)^\frac{3}{2}\) at the point \(P(1, 1, 2)\) in the direction of the vector \(\vec{v} = 2\hat{j} - \hat{k}\).

bonus // Find the equations of (a) the tangent plane and (b) the normal line to the given surface at the specified point. \(x = y^2 + z^2 - 2, P(-1, 1, 0)\).

When you turn-in your test, put this test paper on top, then your work sheets in order, then your scratch paper. I’ll staple and you sign out.

GOOD LUCK.