Name ______________________________

1) Evaluate $\lim_{(x,y)\to(0,0)} \frac{2x^2y}{x^4+y^2}$

2) Find all second partial derivatives of $f(x,y) = x^4 + 3x^2y^3$

3) Find f_{xyx} for $f(x,y,z) = \frac{x^2+z}{xy}$

4) Find the equation of the plane tangent to $z = \sqrt{4 - x^2 - 2y^2}$ at (1,-1,1)

5) Find the linear approximation of the function $f(x,y) = \sqrt{20 - x^2 - 7y^2}$ at (2,1) and use it to approximate $f(1.98, 1.08)$.

6) Find $\frac{\partial z}{\partial t}$ given $z = e^{xy}\tan(y)$ where $x = s + 2t$ and $y = \frac{s}{t+3}$

7) The radius of a right circular cone is increasing at a rate of 1.8 in/s while its height is decreasing at a rate of 2.5 in/s. At what rate is thevolume of the cone changing when the radius is 120 in and the height is 140 in?

8) Find the directional derivative of $f(x,y,z) = x^2 + y^2 + z^2$ at (1,2,-1) in the direction of $< 1, -2, 3 >$

9) The temperature at a point (x,y) on a metal plate is given by $T(x,y) = \frac{x}{x^2+y^2}$. Find the direction of greatest increase in heat at the point (3,4).

10) Use Lagrange multipliers to find maximum and minimum values of $f(x,y) = \frac{1}{x} + \frac{1}{y}$ subject to the constraint $\frac{1}{x^2} + \frac{1}{y^2} = 1$. Use Maple to show that the two curves are tangent in the first quadrant, ie let x=1.1 to 2, y=1.1 to 2 This avoids the asymptotes and makes the graphs easier to see. Just draw one contour line at the solution. (maple commands needed: plot, contourplot, display)