

# Calc 3 - Assignment 15

Note Title

10/12/2011

① If  $f(x,y) = \sqrt{4-x^2-4y^2}$ , find  $f_x(1,0)$  and  $f_y(1,0)$  and interpret as slopes.

② Verify that  $u_{xy} = u_{yx}$  for  $u(x,y) = x \sin(x+2y)$

③ Which is a solution to Laplace's PDE  $u_{xx} + u_{yy} = 0$

a)  $u = x^2 + y^2$

b)  $u = x^2 - y^2$

c)  $u = \sin(x) \cosh(y) + \cos(x) \sinh(y)$

d)  $u = e^{-x} \cos(y) - e^{-y} \cos(x)$

④ Show that  $u = \frac{1}{a^2} t^2 - x^2$  solves the Wave Equation  $u_{tt} = a^2 u_{xx}$  ..

⑤ How many  $n$ -th order partial derivatives does a function  $f(x,y)$  have?

⑥ Find equation of the tangent plane to the given surface at the specified point:

a)  $z = y \ln(x)$  at  $(1,4,0)$

b)  $z = \sqrt{xy}$  at  $(1,1,1)$

⑦ Graph the surface and its tangent plane at the given point using Maple:

$$z = x^2 + xy + 3y^2 \text{ at } (1, 1, 5)$$

⑧ Use the Chain Rule to find  $\frac{dz}{dt}$  for

a)  $z = x^2 + y^2 + xy$ ,  $x = \sin(t)$ ,  $y = e^t$

b)  $z = \cos(x + 4y)$ ,  $x = 5t^2$ ,  $y = \frac{1}{4}$

⑨ Use the Chain Rule to find  $\frac{\partial z}{\partial s}$  and  $\frac{\partial z}{\partial t}$  for

a)  $z = x^2 y^3$ ,  $x = s \cdot \cos(t)$ ,  $y = s \cdot \sin(t)$

b)  $z = \arcsin(x - y)$ ,  $x = s^2 + t^2$ ,  $y = 1 - 2s \cdot t$