

Calc 3 - Assignment 15

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