MATH 241 Thomas 13th Edition Name______________

Chapter 14, Section 4

Tangent plane at a point on a smooth surface in space.

If $r = g(t)\mathbf{i} + h(t)\mathbf{j} + k(t)\mathbf{k}$ is a smooth curve on the level surface $f(x, y, z) = c$ of a differentiable function f, then

At every point along the curve, ∇f is orthogonal to the curve's velocity vector.

The tangent plane at the point $P_0(x_0, y_0, z_0)$ on the level surface $f(x, y, z) = c$ of a differentiable function f is

The normal line is the line through the point

Tangent Plane to $f(x, y, z) = c$ at $P_0(x_0, y_0, z_0)$ is

Normal line to $f(x, y, z) = c$ at $P_0(x_0, y_0, z_0)$ is

To find the equation for the plane tangent to a smooth surface $z = f(x, y)$ at a point $P_0(x_0, y_0, z_0)$ where $z_0 = f(x_0, y_0)$

A plane tangent to a surface $z = f(x, y)$ at $(x_0, y_0, f(x_0, y_0))$ is

Estimating the change in f in a direction u

The linearization of a function $f(x, y)$ at a point (x_0, y_0) where f is differentiable is the function

The approximation $f(x,y) \approx L(x,y)$ is the standard approximation of f at (x_0, y_0).

$df =$

Examples: $x^2 + y^2 - 2xy - x + 3y - z = -4,\ (2,-3,18)$

$z = 4x^2 + y^2,\ (1,1,5)$

$x^2 + y^2 = 4,\ x^2 + y^2 - z = 0,\ (\sqrt{2}, \sqrt{2}, 4)$

$f(x,y,z) = e^x \cos(yz)$

$f(x,y) = x^3 y^4$