
MA110 - Engineering Mathematics-1
Problem Sheet - 5

Tangent Planes and Normal Lines

1. How do you find the tangent line at a point on a level curve of a differentiable function $f(x, y)$? How do you find the tangent plane and normal line at a point on a level surface of a differentiable function $f(x, y, z)$? Give examples.
2. Find an equation for the plane tangent to the level surface $f(x, y, z) = c$ at the point P_0 . Also, find parametric equations for the line that is normal to the surface at P_0 .
 - (a) $x^2 - y - 5z = 0$, $P_0(2, -1, 1)$
 - (b) $x^2 + y^2 + z = 4$, $P_0(1, 1, 2)$
3. Find an equation for the plane tangent to the surface $z = f(x, y)$ at the given point.
 - (a) $z = \ln(x^2 + y^2)$, $(0, 1, 0)$
 - (b) $z = 1/(x^2 + y^2)$, $(1, 1, 1/2)$
4. Find parametric equations for the line that is tangent to the curve of intersection of the surfaces at the given point.
 - (a) Surfaces: $x^2 + 2y + 2z = 4$, $y = 1$, Point: $(1, 1, 1/2)$
 - (b) Surfaces: $x + y^2 + z = 2$, $y = 1$, Point: $(1/2, 1, 1/2)$
