

Recitation Week 4

SECTIONS 12.6, 12.7

1. Find the linearization of $f(x, y, z) = (\sin(xy))/z$ at $(\pi/2, 1, 1)$ and at $(2, 0, 1)$.
2. Find the linearization $L(x, y, z)$ of $f(x, y, z) = xy + 2yz - 3xz$ at $P_0(1, 1, 0)$.
3. By about how much will $f(x, y, z) = \ln \sqrt{x^2 + y^2 + z^2}$ change if the point $P(x, y, z)$ moves from $P_0(3, 4, 12)$ a distance of $ds = 0.1$ in the direction of $3\vec{i} + 6\vec{j} - 2\vec{k}$?
4. The Celsius temperature in a region in space is given by $T(x, y, z) = 2x^2 - xyz$. A particle is moving in this region and its position at time t is given by $x = 2t^2$, $y = 3t$, $z = -t^2$, where time is measured in seconds and distance in meters.
 - How fast is the temperature experienced by the particle changing in degrees Celsius per meter when the particle is at $P(8, 6, -4)$?
 - How fast is the temperature experienced by the particle changing in degrees Celsius per second at P ?
5. A flat circular plate has the shape of the region $x^2 + y^2 \leq 1$. The plate, including the boundary, is heated so that the temperature is $T(x, y) = x^2 + 2y^2 - x$. Find the temperatures at the hottest and coldest points on the plane.