

Math 2313, Test II

Name _____

1. If $f(x, y, z) = \ln(\sqrt{x^3 + y + z^2})$,
- Find the gradient of f at $(1, 1, 1)$.
answer: $\langle \frac{1}{2}, \frac{1}{6}, \frac{1}{3} \rangle$
 - Find the derivative of f at $(1, 1, 1)$ in the direction of the vector $\langle 2, 2, -1 \rangle$.
answer: $\frac{1}{3}$
 - In what direction is the directional derivative largest, at the point $(1, 1, 1)$?
answer: $\langle \frac{1}{2}, \frac{1}{6}, \frac{1}{3} \rangle$
 - Find the equation of the tangent plane to the surface $f(x, y, z) = \ln(\sqrt{3})$ at $(1, 1, 1)$.
answer: $3x + y + 2z = 6$

2. If $f(x, y, z) = ye^{xz}$ find f_{xyz} .

answer: $(1 + xz)e^{xz}$

3. The volume of a "frustum" is $V = \pi h(r^2 + rR + R^2)/3$ where h is the height and r and R are the smaller and larger radii. If, when $h = 12, r = 4, R = 10$, R is decreasing at the rate of 2 cm/hour, h is increasing at the rate of 1 cm/hour, and r is not changing, how fast is the volume changing?

answer: -140π cm/hour

4. If $f(x, y) = x^2 + y^2$, and we move from the point $(2, 1)$ to the point $(2.1, 1.05)$, use differentials to compute the approximate change df , and then calculate the exact change Δf .

answer: $df = 0.5, \Delta f = 0.5125$