

Homework Set # 5

1. (§2.5) Page 132: # 5, 13(a).
2. (§2.6) Page 142: # 1, 2(b), 6, 8(a)(b), 9(a), 22(a)(b), 31.
3. Given the following equation relating  $x, y$ , and  $z$ , answer the questions below:

$$y^3 + x^2 - yz^3 = 4xz + 12 \quad (\#)$$

- (a) If  $z = z(x, y)$  is defined implicitly by (#), compute  $\frac{\partial z}{\partial y}$ .
  - (b) If  $y = y(x, z)$  is defined implicitly by (#), compute  $\frac{\partial y}{\partial x}$ .
  - (c) Find an equation of the tangent plane to the surface defined by (#) at the point  $(x_0, y_0, z_0) = (-2, 0, 1)$ .
4. Let  $f(x, y, z) = x^2y + xe^{-z}$  and  $\mathbf{c}(t) = (t^2 + t, t^{-1}, t - 1)$ .
    - (a) Find the rate of change of  $f$  along the path  $\mathbf{c}$  at  $t = 1$ .
    - (b) Find the directional derivative of  $f$  in the direction of the tangent to the path  $\mathbf{c}$  at  $t = 1$ .
  5. Compute the directional derivative of  $f(x, y, z) = x^2y + xe^{-z} + 10$  at  $(1, -2, 0)$  in the direction from  $(1, -2, 0)$  towards the origin. Is the function  $f$  increasing or decreasing?
-