

Name: _____

MA 3330: Worksheet 1

1. For the function below find the tangent plane at the point $P(2, 1)$.

$$f(x, y) = 3x^2y - e^{x^2-y-3}$$

2. For the function below use the tangent plane to estimate $f(1.1, 2.9)$.

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

3. For the function below use the tangent plane to estimate $f(1.1, 0.9, 2.9)$.

$$f(x, y, z) = \sin(x^2 - y^2) - z^3$$

4. For this problem consider the function $f(x, y) = x^2 + y^2$ and the path given by

$$\mathbf{r}(t) = \langle t \cos(t), t \sin(t) \rangle$$

- (a) Graph the function f .
 - (b) Graph the path $\mathbf{r}$ in $\mathbb{R}^2$.
 - (c) Graph the path $\mathbf{r}$ as it traces the function f .
 - (d) Use the chain rule to compute $f_t(t)$ for $f(x, y)$ and the path given.
5. For this problem consider the function $f(x, y, z) = 5xy - y^2$ and the plane $x - 2y + z = 7$.
- (a) Find the parametric equation for the plane $x - 2y + z = 7$.
 - (b) Use the chain rule to compute $f_s(s, t)$ and $f_t(s, t)$ for $f(x, y, z) = x^2 + y^2$ over the plane $x - 2y = 7$
6. Find the extrema. Use either technique.
- (a) $f(x, y) = x^4 + y^4 - 16xy$
 - (b) $f(x, y) = 2xy + 3x + 4y$
 - (c) $f(x, y) = x^3 + y^3 - 300x - 75y - 3$
 - (d) Minimize $f(x, y) = x^2 + y^2$ on the hyperbola $xy = 1$.
 - (e) Maximize $f(x, y, z) = 2x + 3y + 5z$ on the sphere $x^2 + y^2 + z^2 = 1$.