

## Math 234 Discussion Worksheet - Sep 25

1. Let  $f(x, y) = \arctan\left(\frac{y}{x}\right)$ .
- (1) Compute the partial derivatives  $f_x$  and  $f_y$ .
  - (2) Find the linear approximation of  $f$  near  $(1, 1)$ .
  - (3) Find the tangent plane to the graph of  $f$  at  $(1, 1)$ .
  - (4) Find the gradient of  $f$  at  $(1, 1)$ .
  - (5) What is the level curve of  $f$  that passes through  $(1, 1)$ ?
  - (6) How is the gradient you found in (4) related to the level curve in (5)?

$$(1) f_x = -\frac{y}{x^2+y^2}, f_y = \frac{x}{x^2+y^2}$$

$$(2) f(x, y) \approx \frac{\pi}{4} - \frac{1}{2}(x-1) + \frac{1}{2}(y-1)$$

$$(3) z = \frac{\pi}{4} - \frac{1}{2}(x-1) + \frac{1}{2}(y-1)$$

$$(4) \nabla f(1, 1) = \left(-\frac{1}{2}, \frac{1}{2}\right)$$

$$(5) \text{ the line } y = x$$

$$(6) \text{ perpendicular}$$