

Math 32 A: Practice Midterm 2

1. What are the domain and range of the following functions?

a. $f(x, y) = 4x^2 + y^2 + 1$

b. $f(x, y) = \frac{1}{\ln(x+y^2)}$

2. Find an equation for the surface obtained by rotating the line $z = 4y$ about the z axis. What type of surface is this?

3. Find the limit of the following functions if they exist

a. $\lim_{(x,y) \rightarrow (1,2)} \frac{e^{xy}}{x^2+5y^3}$

b. $\lim_{(x,y) \rightarrow (1,2)} \frac{\sin(x)}{(x-1)^2+5(y-2)^3}$

4. Show that the function $u(x, y, t) = e^{-\mu t} \sin(x) \cos(y)$ satisfies the heat equation

$$u_t = \frac{\mu}{2}(u_{xx} + u_{yy}).$$

5. a. Find an equation for the tangent plane to the surface given by $f(x, y) = \frac{\sin(x)}{x^2+3y^3}$ at the point $(x, y) = (1, 3)$.

b. Does the line parameterized as $\mathbf{r}(t) = (t, 3, 5t)$ lie in the tangent plane?