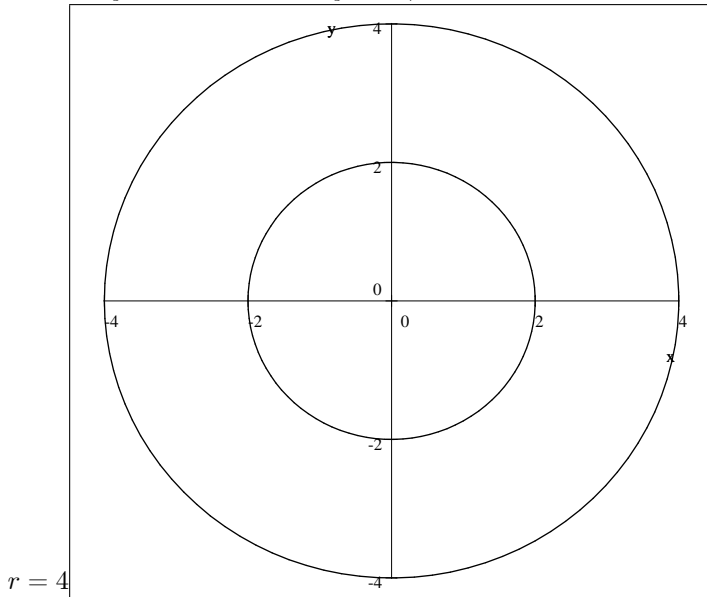


Name:.....Serial#:.....Sec #:.....

**Q.1:** Find and sketch the domain of the function  $f(x, y) = \sqrt{-x^2 - y^2 + 16} + \ln(x^2 + y^2 - 4)$ .

**Sol:**  $-x^2 - y^2 + 16 \geq 0 \Rightarrow x^2 + y^2 \leq 16$ , inside circle of radius 4  
 $x^2 + y^2 - 4 > 0 \Rightarrow x^2 + y^2 > 4$ , outside circle of radius 2.



**Q.2:** Show that the limit  $\lim_{(x,y) \rightarrow (0,0)} \frac{6xy}{2x^2 + 3y^2}$  does not exist.

**Sol:** Let  $y = mx$ , then  $\lim_{(x,y) \rightarrow (0,0)} \frac{6xy}{2x^2 + 3y^2} = \lim_{x \rightarrow 0} \frac{6x^2m}{2x^2 + 3m^2x^2} = \lim_{x \rightarrow 0} \frac{6m}{2 + 3m^2}$ . Thus Limit is not unique.

**Q.3:** Find all the second order partial derivatives of  $f(x, y) = \ln(-2x + 3y)$ .

**Sol:**  $f(x, y) = \ln(-2x + 3y) \Rightarrow f_x = \frac{-2}{-2x + 3y}, f_y = \frac{3}{-2x + 3y}$  and  $f_{xx} = \frac{-4}{(-2x + 3y)^2}, f_{yy} = \frac{-9}{(-2x + 3y)^2}, f_{xy} = \frac{6}{(-2x + 3y)^2}$ .