

$$11. \lim_{(x,y) \rightarrow (0,0)} \left(\frac{3x^2y}{x^2+y^2} \right)$$

$$= \lim_{r \rightarrow 0} \frac{3(r \cos \theta)^2 (r \sin \theta)}{r^2}$$

$$= \lim_{r \rightarrow 0} \frac{3 r^2 \cos^2 \theta + r \sin \theta}{r^2}$$

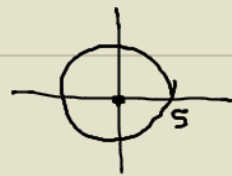
$$= \lim_{r \rightarrow 0} 3 \cos^2 \theta \cdot r \sin \theta$$

$$= 3 \cos^2 \theta \cdot 0 \cdot \sin \theta$$

$$= \textcircled{0}$$

$$\cos \theta = \frac{x}{r} \quad \sin \theta = \frac{y}{r}$$

$$x = r \cos \theta \quad y = r \sin \theta$$



$$r^2 = x^2 + y^2$$

$$12. \lim_{(x,y) \rightarrow (0,0)} \frac{6 \sin(x^2+y^2)}{x^2+y^2}$$

$$= \lim_{r \rightarrow 0} \frac{6 \sin(r^2)}{r^2}$$

$$= \lim_{r \rightarrow 0} \frac{6 \cos(r^2) \cdot \cancel{\frac{d}{dr}(r^2)}}{\cancel{\frac{d}{dr}(r^2)}}$$

$$= \lim_{r \rightarrow 0} 6 \cos(r^2)$$

$$= 6 \cos 0^2$$

$$= 6 \cos 0$$

$$= 6(1)$$

$$= \textcircled{6}$$

$$13. f(x,y,z) = \frac{z^3}{x^2-y-5}$$

$$x^2 - y - 5 = 0$$

$$x^2 - y = 5$$

$$x^2 - y \neq 5$$

$$\text{CONT: } \{(x,y,z) \mid x^2 - y \neq 5\}$$

NOTE:

$$f(x,y) = \sqrt{x-y}$$

$$f(x,y) = \text{Log}(x^2y)$$

$$x-y \geq 0$$

$$x^2y > 0$$

$$\{(x,y) \mid x-y \geq 0\}$$

$$\{(x,y) \mid x^2y > 0\}$$