#1    Domain : $\ln(15 - x^2 - 15y^2)$ is only

defined when $15 - x^2 - 15y^2 > 0$.

Therefore, the domain is $\{(x,y) : 15 - x^2 - 15y^2 > 0\}$

Range : The maximum $\ln(15 - x^2 - 15y^2)$ can be

is $\ln(15)$ [when $x = y = 0$].

The minimum is limitless! So our

range is $(-\infty, \ln(15)]$

#2

Consider the path along $x = 0$

$$\lim_{(x,y) \to (0,0)} \frac{\overset{0}{\cancel{x}} - 9y}{18y + 5\underset{0}{\cancel{x}}} = -\frac{1}{2}$$

Consider the path along $y = 0$

$$\lim_{(x,y) \to (0,0)} \frac{x - 9\overset{0}{\cancel{y}}}{18\underset{0}{\cancel{y}} + 5x} = \frac{1}{5}$$

Since the limit along different paths is not the same, the limit DNE.