

### **Example 1 (Lagrange Multipliers)**

Find the extreme values of  $f(x, y) = x^2 + 2y^2$  on the circle  $x^2 + y^2 = 1$ .

### **Example 2 (Limits)**

Show that the following limit does not exist.

$$\lim_{(x,y) \rightarrow (0,0)} \frac{3y^2 - 4x^{10}}{4x^{10} + 2x^5y - 3y^2}$$

### **Example 3 (Critical Points)**

Find the local maximum and minimum values and saddle point(s) of the function  $f(x, y) = (x^2 + y^2)e^{y^2 - x^2}$ .