$f(x, y) = 4x^2 + 4y^2$, $g(x, y) = xy = 1$, and $\nabla f = \lambda \nabla g \quad \Rightarrow$ $\langle 8x, 8y \rangle = \langle \lambda y, \lambda x \rangle$, so $8x = \lambda y$, $8y = \lambda x$, and $xy = 1$. From the last equation, $x \neq 0$ and $y \neq 0$, so $8x = \lambda y \quad \Rightarrow \quad \lambda = 8x/y$. Substituting, we have $8y = (8x/y)\,x \quad \Rightarrow \quad y^2 = x^2 \quad \Rightarrow \quad y = \pm x$. But $xy = 1$, so $x = y = \pm 1$ and the possible points for the extreme values of f are $(1, 1)$ and $(-1, -1)$. Here there is no maximum value, since the constraint $xy = 1$ allows x or y to become arbitrarily large, and hence $f(x, y) = 4x^2 + 4y^2$ can be made arbitrarily large. The minimum value is $f(1, 1) = f(-1, -1) = 8$.