1. Find the minimum value of $f(x,y) = x^2 + 2y^2 - xy$ subject to the constraint $\underbrace{2x+y}_{g(x,y)} = \underbrace{22}_{k}$.

① $f_x = 2x - y$ $\quad g_x = 2$

$f_y = 4y - x$ $\quad g_y = 1$

② $\begin{cases} f_x = \lambda g_x \\ f_y = \lambda g_y \\ g = k \end{cases} \longrightarrow \begin{cases} 2x - y = 2\lambda \\ 4y - x = \lambda \\ 2x + y = 22 \end{cases}$ Divide $\frac{2x-y}{4y-x} = 2$

$2x - y = 8y - 2x$

$4x = 9y$

$\frac{4}{9}x = y$

$2x + \frac{4}{9}x = 22$

$\frac{22}{9}x = 22$

$x = 9$

$y = \frac{4}{9}(9) = 4$

$f(9,4) = (9)^2 + 2(4)^2 - (9)(4)$

$= 81 + 32 - 36$

$= 77$ ↑ Minimum value

Q: A bus driver was heading down a street in Walnut. He went right past a stop sign without stopping, went the wrong way on a one-way street, and then went on the left side of the road past a cop car. The cop did nothing, because he didn't break any traffic laws. Why not?