Name: _____

Given that $x + y = 80$, find the minimum value of $f = x^2 + y^2$.

$$y = 80 - x \implies$$

$$f = x^2 + y^2$$

$$f = x^2 + (80-x)^2$$

$$f' = 2x + 2(80-x)(-1)$$

Set $f' = 0$:

$$2x - 160 + 2x = 0$$

$$4x - 160 = 0$$

$$x = 40$$

$$\implies y = 80 - x = 40$$

$$\implies f = 40^2 + 40^2 = 3200$$