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Find the point on the line $y = 2x + 4$ closest to the point $(3, 0)$.

Let D = distance from $(x, 2x+4)$ to $(3, 0)$. Then

$$D^2 = (x-3)^2 + (2x+4)^2$$

$$\begin{aligned}\frac{d}{dx}(D^2) &= 2(x-3) + 2(2x+4)(2) \\ &= 2x - 6 + 8x + 16 \\ &= 10x + 10\end{aligned}$$

so the critical point is at $x = -1$.

Clearly this is a minimum since $D \rightarrow \infty$
as $x \rightarrow \pm \infty$.

