Let d be the distance from the point $(2, 2, 0)$ to any point (x, y, z) on the cone, so $d = \sqrt{(x-2)^2 + (y-2)^2 + z^2}$ where $z^2 = x^2 + y^2$, and we minimize $d^2 = (x-2)^2 + (y-2)^2 + x^2 + y^2 = f(x, y)$. Then $f_x(x, y) = 2(x-2) + 2x = 4x - 4$, $f_y(x, y) = 2(y-2) + 2y = 4y - 4$, and the critical points occur when $f_x = 0 \quad \Rightarrow \quad x = 1$, $f_y = 0 \quad \Rightarrow \quad y = 1$. Thus the only critical point is $(1, 1)$. An absolute minimum exists (since there is a minimum distance from the cone to the point) which must occur at a critical point, so the points on the cone closest
to $(2, 2, 0)$ are $\left(1, 1, \pm\sqrt{2}\right)$.