Direction vector \( \overrightarrow{AO} = <-80, -60> \)

Unit vector in the direction \( \overrightarrow{AO} \):

\[
\hat{u} = \frac{\overrightarrow{AO}}{||\overrightarrow{AO}||} = \frac{-1}{10 \sqrt{64+36}} <80,60> = <0.8,0.6> \\
\]

\[
f(x,y) = \text{depth} = z = 200 + 0.02 x^2 - 0.001 y^3 \\
\]

\[
\nabla f|_A = \begin{vmatrix} 80 & \frac{\partial f}{\partial x} \\ 60 & \frac{\partial f}{\partial y} \end{vmatrix} = \begin{vmatrix} 80 & \frac{\partial f}{\partial x} \\ 60 & \frac{\partial f}{\partial y} \end{vmatrix} = <3.2, -10.8> \\
\]

\[
D_\hat{u} f(A) = \nabla f|_A \cdot \hat{u} = <3.2, -10.8> \cdot <0.8, -0.6> = 2.56 + 6.48 = 3.92 > 0 \\
\]

Conclusion: depth increases as the boat approaches the buoy at the rate of 3.92 meter (of depth) per meter navigated on the lake.