Special Problem 2-5.20

Contour $C$ is a straight line extending from point $P_a$ to point $P_b$.

Contour $C$ passes through the origin.

Point $P_a$ is located at $\vec{r}_a = -\left( \hat{a}_x + \hat{a}_z \right)$.

Point $P_b$ is located at $\vec{r}_b = 2\left( \hat{a}_x + \hat{a}_z \right)$.

Vector field $\mathbf{A}(\vec{r}) = r^2 \sin \theta \, \hat{a}_x$.

Evaluate the contour integral $\int_C \mathbf{A}(\vec{r}) \cdot d\vec{l}$.