Special Problem 2-5.10

Evaluate the integral:

\[ \int _{C} \mathbf{G}(\mathbf{r}) \cdot d\ell \]

where \( \mathbf{G}(\mathbf{r}) \) is some arbitrary vector field equal to:

\[ \mathbf{G}(\mathbf{r}) = \pi r \sin \phi \mathbf{\hat{r}} + 2 \mathbf{\hat{\phi}} + r^2 \mathbf{\hat{\theta}} \]

and contour \( C \) lies on the \( y-z \) plane as shown below: