Special Problem 2-5.10

Evaluate the integral:

$$\int_C \boldsymbol{G}(\bar{r}) \cdot \overline{d\ell}$$

where $\boldsymbol{G}(\bar{r})$ is some **arbitrary** vector field equal to:

$$\boldsymbol{G}(\bar{r}) = \pi r \sin\phi \; \hat{a}_r + 2 \; \hat{a}_\theta + r^2 \; \hat{a}_\phi$$

and contour C lies on the ***y-z* plane** as shown below: