Special Problem 2-5.7

Vector $\mathbf{A}(\mathbf{r}) = \nabla g(\mathbf{r})$, where:

$$g(\mathbf{r}) = (x^2 + y^2)z$$

We know that the contour integral

$$\int_{C} \mathbf{A}(\mathbf{r}) \cdot d\ell = 15,$$

where the contour $C$ begins at point $P_1(x=1, y=2, z=1)$, and ends at point $P_2$.

If point $P_2$ is located a distance of 5 units above the $x$-$y$ plane, how far is point $P_2$ from the $z$-axis?