Special Problem 2-5.31

The outer surface of some volume V forms a **closed** surface S.

Closed surface S is a complex surface consisting of surfaces S_1 and S_2, such that $S = S_1 + S_2$.

There exists throughout space some vector field $\mathbf{A}(\bar{r})$.

The following facts are known:

$$\iiint_V \nabla \cdot \mathbf{A}(\bar{r})\, dv = 7 \qquad \text{and} \qquad \iint_{S_1} \mathbf{A}(\bar{r}) \cdot \overline{ds_1} = 2$$

where $\overline{ds_1}$ is pointing **outward** from the volume V.

1. Determine the **value** of the following surface integral (make sure you give complete, detailed and specific **justification** for you result):

$$\iint_{S_2} \mathbf{A}(\bar{r}) \cdot \overline{ds_2}\,.$$

2. From these facts, **can** you determine (with complete certainty) if the vector field $\mathbf{A}(\bar{r})$ is **solenoidal** (make sure you give complete, detailed and specific **justification** as to why or why not)?

3. From these facts, **can** you determine (with complete certainty) if the vector field $\mathbf{A}(\bar{r})$ is **conservative** (make sure you give complete, detailed and specific **justification** as to why or why not)?