Vector Differential: Rectangular Coordinates:

Find the general form for $d\vec{r}$ in rectangular coordinates by determining $d\vec{r}$ along the specific paths in the figure below.

- Path 1:

  $$d\vec{r} =$$
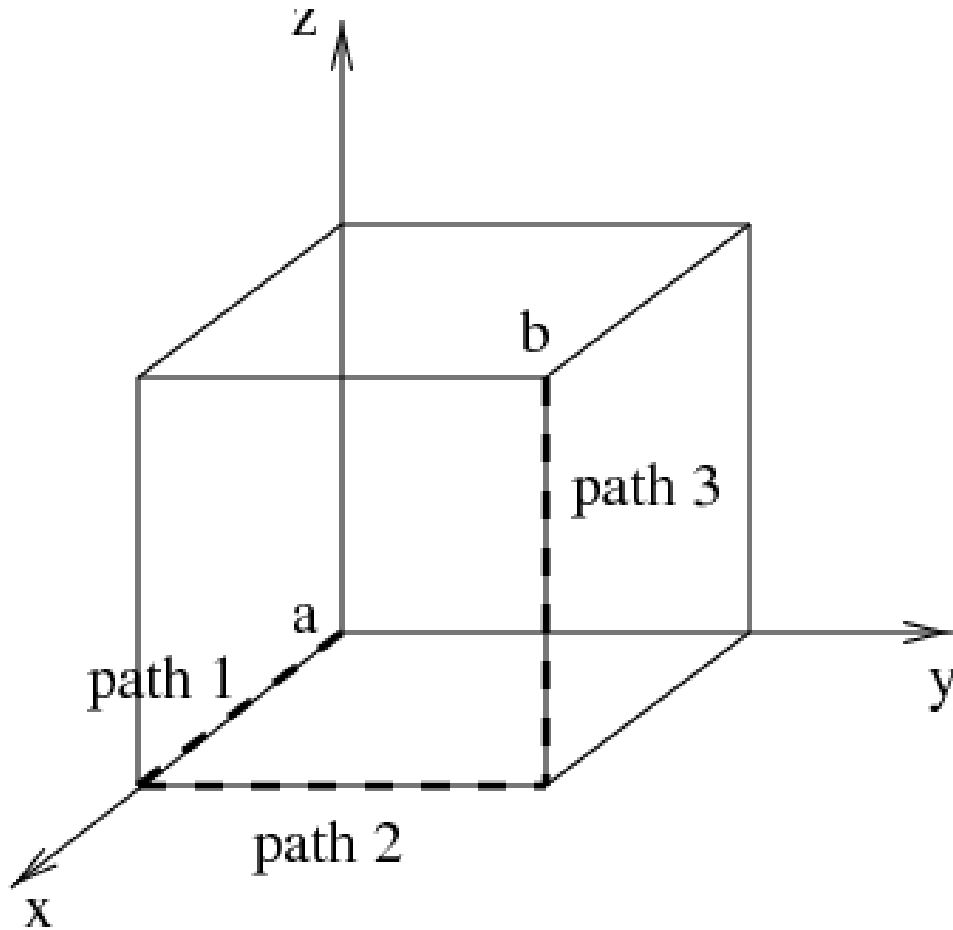
- Path 2:

  $$d\vec{r} =$$

- Path 3:

  $$d\vec{r} =$$

If all three coordinates are allowed to change simultaneously, by an infinitesimal amount, we could write this $d\vec{r}$ for any path as:

$$d\vec{r} =$$

This is the general line element in rectangular coordinates.

Figure 1: Figure 1: $d\vec{r}$ in rectangular coordinates

Solution

- Path 1:
$$d\vec{r} = dx\,\hat{x}$$

- Path 2:
$$d\vec{r} = dy\,\hat{y}$$

- Path 3:
$$d\vec{r} = dz\,\hat{z}$$

- In general:
$$d\vec{r} = dx\,\hat{x} + dy\,\hat{y} + dz\,\hat{z}$$