**Question (1150003)**

**Adding position and displacement vectors**

The initial position of a mouse in a maze is \((0.2, 0, 0.6)\) m. Its displacement (i.e. *change in position*) during a time interval of 1 minute is \((-0.5, 0, 0.3)\) m. What is its new position?

**Solution**

Restate the question in terms of variables.

- initial position: \(\vec{r}_i = <0.2, 0, 0.6> \text{ m} \)
- displacement: \(\Delta \vec{r} = <-0.5, 0, 0.3> \text{ m} \)
- final position: \(\vec{r}_f = ? \text{ m} \)

Sketch a picture of the situation.

![Figure 1: The initial position, displacement, and final position of a mouse.](image)

The definition of displacement is “change of position” or

\[
\Delta \vec{r} = \vec{r}_f - \vec{r}_i
\]

To get the mouse’s new position, take its initial position and add its displacement.

\[
\vec{r}_f = \vec{r}_i + \Delta \vec{r}
\]

Substituting for the variables gives:
\vec{r}_f = \vec{r}_i + \Delta \vec{r}
\vec{r}_f = <0.2, 0, 0.6> + < -0.5, 0, 0.3 > m
\vec{r}_f = <-0.3, 0, 0.9> m

Compare this answer to the vector shown in the picture. They are consistent, thus giving one confidence that it the answer is probably correct.