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# I. Prince Help (PNG Version)

## Example 2: Calculating Displacement: A Subway Train

What are the magnitude and sign of displacements for the motions of the subway train shown in parts (a) and (b) of Figure 7?

### Strategy

A drawing with a coordinate system is already provided, so we don't need to make a sketch, but we should analyze it to make sure we understand what it is showing. Pay particular attention to the coordinate system. To find displacement, we use the equation  $\Delta x = x_f - x_0$ . This is straightforward since the initial and final positions are given.

### Solution

1. Identify the knowns. In the figure we see that  $x_f = 6.70 \text{ km}$  and  $x_0 = 4.70 \text{ km}$  for part (a), and  $x_f = 3.75 \text{ km}$  and  $x_0 = 5.25 \text{ km}$  for part (b).

2. Solve for displacement in part (a).

$$\Delta x = x_f - x_0 = 6.70 \text{ km} - 4.70 \text{ km} = +2.00 \text{ km}$$

3. Solve for displacement in part (b).

$$\Delta x' = x'_f - x'_0 = 3.75 \text{ km} - 5.25 \text{ km} = -1.50 \text{ km}$$

**Discussion**

The direction of the motion in (a) is to the right and therefore its displacement has a positive sign, whereas motion in (b) is to the left and thus has a negative sign.