4–1 Graphing Uniformly Accelerated Motion

Equipment

position-time graph
pencil

Objective

During this investigation you will
• study the behavior of an object under the influence of gravity using data from a position-time graph.

Procedure

1. Study Graph I, the position-time graph for an arrow shot vertically into the air. Recall that the slope of the curve at any point is equal to the instantaneous velocity at that time.

2. Determine the instantaneous velocity of the arrow at $t = 1, 2, 3$, and 4 seconds. To do this, construct the tangents to the curve at these times and determine the slopes of the tangents. Record your data in the second column of Table 4–1.

3. Plot a velocity-time graph using your data from Table 4–1.

4. The slope of a velocity-time graph is equal to the acceleration. Using the same method that you used in Step 2, determine the accelerations at $t = 0, 1, 2, 3$, and 4 seconds. Enter the values in the third column of Table 4–1.

5. Plot an acceleration-time graph on Graph III.

Interpretation

1. Describe the magnitude and direction of the change in velocity with time.

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2. What is the significance of a negative velocity?

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3. What does the shape of the curve in Graph III tell you about the acceleration of gravity?

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4. What is the acceleration when $v = 0$ m/s? Explain.

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