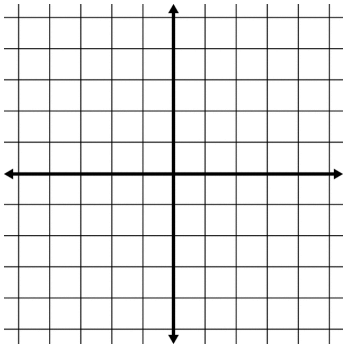
The Lovely Ladybug

Name:_____

A ladybug moves along a branch so that its position from the trunk of the tree at time t is given by $s(t) = t^2 - 6t + 5$, for $0 \leq t \leq 5$, where $s(t)$ is measured in yards and t is measured in minutes.

1. Find an equation for the velocity of the ladybug, $v(t)$.

2. Sketch the graph of $v(t)$. Use proper units to label your axes.



   a. What does a negative velocity tell you about the direction the ladybug is walking?

   b. What does a positive velocity tell you about the direction the ladybug is walking?

3. At what time is the ladybug at rest? How do you know?

4. Let's look at what is happening with the ladybug at $t = 1$.
   a. Find $v(1)$. Use proper units.

   b. Find $v'(1)$. What does your answer mean in the context of this problem? Use proper units.

   c. At $t = 1$, is the ladybug speeding up or slowing down? How do you know?

5. Off on another branch of the tree, a worm is crawling at a velocity given by $v(t) = -4t + 3$ where $v(t)$ is measured in yards per minute, and t is in minutes. Find a possible function that would give the position, $s(t)$, of the worm.

Topic 4.2—Position, Velocity, and Acceleration

Important Ideas:

Check Your Understanding!

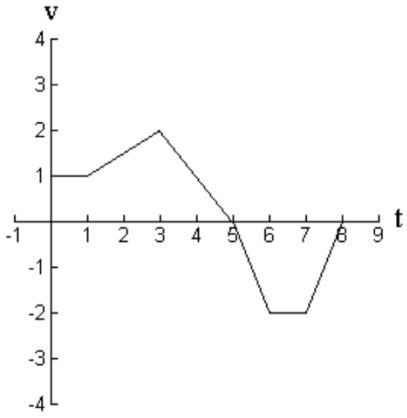
1. The position of a yo-yo is given by $H(t) = t^3 - 6t^2 + 5t + 30$, where t is measured in seconds and $H(t)$ is measured in inches.
   a. Find the average velocity of the yo-yo over the first four seconds.

   b. Find the instantaneous velocity of the yo-yo at $t = 3$ seconds.

2. The position of an object is given by $x(t) = \cos(3t) - \sin(4t)$. Find the acceleration at $t = 0$.

3. The graph of $v(t)$ is shown below, representing the velocity of an object moving on a line over the time interval [0,8].
   a. When is the object at rest? Justify your answer.

   b. At $t = 2$, is the object speeding up or slowing down? Explain your answer.



4. Let $v(t) = \frac{1}{\pi} + \sin(3t)$ represent the velocity of an object moving on a line. On the interval $[\frac{\pi}{2}, \pi]$, what is the velocity when the acceleration is 3?