

Name: _____

Rates of Change

Exercise 1: An object moves in the x-direction in such a way that its displacement from the y-axis is:

$$x = 3t^3 - 30t^2 + 64t + 57, \text{ for } t \geq 0 \quad \text{where } x \text{ is in miles and } t \text{ is in hours.}$$

- 1) Find equations for its velocity and acceleration.
- 2) Find the velocity and acceleration at $t = 2$, $t = 4$, and $t = 6$.
- 3) At each time, state:
 - a) Whether x is increasing or decreasing, and at what rate.
 - b) Whether the object is speeding up or slowing down, and how you decided
 - c) At what times in the interval $[0, 8]$ is x at a maximum? Is x ever negative in the interval?

Exercise 2: An object moves in the x-direction in such a way that its displacement from the y-axis is:

$$x = 7t^3 - 5t^2 + 6t + 3, \text{ for } t \geq 0 \quad \text{where } x \text{ is in miles and } t \text{ is in hours.}$$

- 1) Find equations for its velocity and acceleration.
- 2) Find the velocity and acceleration at $t = 3$, $t = 5$, and $t = 10$.

Exercise 3: Suppose the distance (in feet) that an object travels in t seconds is given by the formula $s(t) = 2t^3 + 4t - 5$. Find $s(2)$, $v(2)$, and $a(2)$.