Name: _____ Academic Integrity Signature: _____

I have abided by the UNCG Academic Integrity Policy.

Note: Correct numerical answers without justification will receive little or no credit.

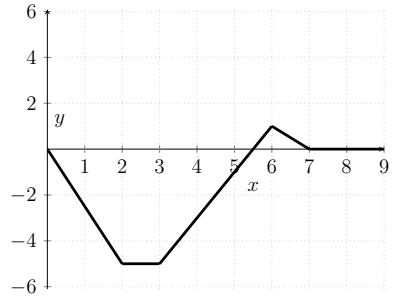
1. (4 points) (Definition) The *instantaneous rate of change* of f at x_0 is

Solution: the derivative

$$f'(x_0) = \lim_{h \to 0} \frac{f(x_0 + h) - f(x_0)}{h},$$

provided this limit exists.

2. The accompanying figure shows the velocity $y = v(t)$ in ft/sec of a particle moving on a line at time t seconds for $0 \leq t \leq 9$.



(a) (2 points) When is the particle moving backwards?

Solution: The particle is moving backwards when the velocity is negative. By looking at the graph, we see that this occurs between $t = 0$ second and $t = 5.5$ seconds. In other words, the particle is moving backwards on the interval $(0, 5.5)$ seconds.

(b) (2 points) When is the particle speeding up?

Solution: When the velocity is positive, the particle is speeding up when the acceleration (rate of change of velocity) is positive. When the velocity is negative, the particle is speeding up when the acceleration is negative. Thus we see that the particle is speeding up on $(0, 2) \cup (5.5, 6)$ seconds.

(c) (2 points) When is the particle's acceleration positive?

Solution: The acceleration is positive when the graph of velocity has positive slope. We see that this happens on the interval $(3, 6)$ seconds.

 Points earned: _____ out of 10.