Name:

2.2 Derivative at a Point

Warm-up: In a time of t seconds, a particle moves a distance of s meters from its starting point, where $s = f(t) = t^2 + 1$.

1. Find the average velocity between $t = 2$ and $t = 2.1$.

2. Find the average velocity between $t = 2$ and $t = 2.01$.

3. Find the average velocity between $t = 2$ and $t = 2.001$.

4. Give your best estimate of the instantaneous velocity of the particle at $t = 2$.

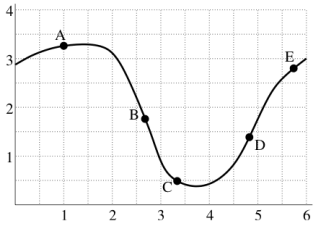
Definitions
The **average velocity** of an object is the change in position per unit change in time. Over time interval $a \leq t \leq b$, where $s(t)$ is the position of the object at time t, it is given by

Definition of Derivative at a point: For any function $f(t)$, we define the derivative at $t = a$, $f'(a)$, by

1. Use the limit definition of derivative to compute $f'(5)$ where $f(x) = \frac{1}{2}x + 3$. Explain why your solutions makes sense.

2. Use the limit definition of derivative to compute $f'(2)$ where $f(x) = \frac{1}{x}$. Explain why your solutions makes sense.

3. For the function shown below, answer the following questions:



   (a) At what points is the slope of the curve positive?

   (b) At what points is the slope of the curve negative?

   (c) Rank the slopes at the 5 points in order from smallest to largest. (Note: negative values are smaller than positive values.)