Name:

2.1 How do we measure speed?

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

The **instantaneous velocity** of an object at a single point in time $t = a$ where position is $s(t)$ is position at time t is

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

   (a) Find the average velocity between $t = 2$ and $t = 2.1$.

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

   (c) Find the average velocity between $t = 2$ and $t = 2.001$.

   (d) Give your best estimate of the instantaneous velocity of the particle at $t = 2$.

2. The position of a car traveling along a straight east/west highway at various times is shown in the table below. Positive values of d indicate that the car is east of its starting point, while negative values of d indicate that the car is west of its starting point.

time (hours)	1	2	3	4	5
position (miles)	40	-10	20	90	-50

   (a) Calculate the average velocity of the car between 1 and 2 hours.

   (b) Calculate the average velocity of the car between 2 and 4 hours.

   (c) What does a negative velocity mean?