# Homework 1

Sections 2.1 & 2.2
Due: 9-30-13

1. The following table gives the position of a particle moving along the $x$-axis as a function of time, $t$, in seconds, where $x$ is in centimeters. What is the average velocity of the particle from $t = 2$ to $t = 6$?

| $t$ | 0 | 2 | 4 | 6 | 8 |
|---|---|---|---|---|---|
| $x(t)$ | 0 | 14 | $-6$ | $-18$ | $-4$ |

2. Use a table (including at least 6 $h$-values) to numerically estimate the instantaneous velocity at time $t = 1$ of an object whose motion at time $t$ is given by $s(t) = e^t$.

3. A particle moves at varying velocity along a line and $s = f(t)$ represents the particle's distance from a point as a function of time, $t$. Sketch a possible graph for $f$ if the average velocity of the particle between $t = 2$ and $t = 6$ is the same as the instantaneous velocity at $t = 5$.

4. If $g$ is an odd function and $g'(4) = 5$, what is $g'(-4)$? Show your work!
**Hint:** It can be shown (using an alternate definition of the derivative) that

$$g'(4) = \lim_{h \to 0} \frac{g(4) - g(4-h)}{h}.$$

Use the standard definition of the derivative to compute $g'(-4)$ and remember that $g$ is an odd function.

5. Use algebra to evaluate the following limit:

$$\lim_{h \to 0} \frac{1/(1+h) - 1}{h}.$$