1. Suppose an object is moving in a straight line according to the formula $s(t) = 5t^2 + 7$. Here the time, t, is measured in seconds and the distance traveled, s, is measured in meters.

   (a) Find the average velocity over the time period from $t = 7$ to $t = 8$. If you use this as an estimate for the instantaneous velocity at $t = 7$, is it an over-estimate or under-estimate?

   (b) Find the average velocity for the time period from $t = 7$ to $t = 7 + h$, where h is a constant. (Your answer will be a function of h.)

   (c) Simplify your expression from part b) so that there is no h in the denominator. Then plug in values $h = \pm 1$, $h = \pm 0.5$, and $h = \pm 0.1$. What is the physical meaning of the numbers you computed?

   (d) What happens to your expression as h becomes very close to zero from both directions? What is the meaning of considering such values of h?

   (e) What is the instantaneous velocity of the object at time $t = 7$? Make sure to state the correct units.

2. For the following graph of $f(x)$, find:

   (a) $\lim_{x \to -5} f(x)$

   (b) $\lim_{x \to -3} f(x)$

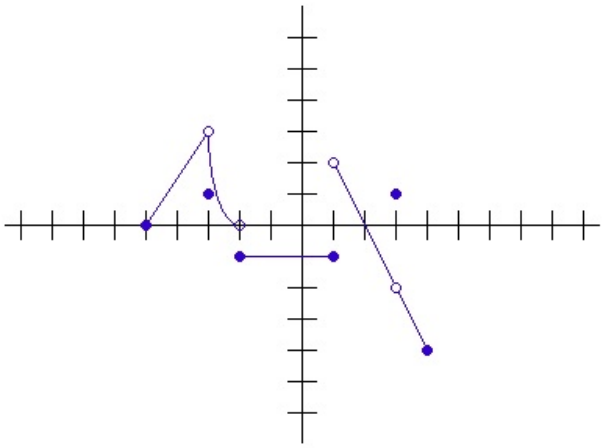
   (c) $\lim_{x \to -2} f(x)$

   (d) $\lim_{x \to 0} f(x)$

   (e) $\lim_{x \to 1} f(x)$

   (f) $\lim_{x \to 3} f(x)$

   (g) $\lim_{x \to 4} f(x)$



3. For each of the four cases below, sketch a graph of some function that satisfies the stated condition.

   (a) $\lim_{x\to 2} f(x) = 3$ and $f(2) = 4$

   (b) $\lim_{x\to 4+} f(x) = 5$ and $\lim_{x\to 4-} f(x) = 7$

   (c) $\lim_{x\to 0} f(x)$ does not exist and $|f(x)| < 2$ for all x

   (d) $\lim_{x\to 0} f(x) = f(0) + 1$