Limit Laws

1. Consider $f(x) = 4x^7 + 3x^6 - 5.5x^5 + 2.1x^2 - 7x + 2$.

   (a) Use the limit laws to find $\lim_{x \to 1} f(x)$. Write all the steps and record which laws you used like we did in class.

   (b) Evaluate $f(1)$.

   (c) What do you notice about the answers to (a) and (b)?

   (d) Is $\lim_{x \to -3} f(x) = f(-3)$? (You do not need to write out all your steps as in (a).)

   (e) Does $\lim_{x \to a} f(x) = f(a)$ for all real numbers a?

2. Let $g(x) = x^{10} - 4x^7 - 4x^5 + 4x^4 - 2.4x + 2$. Does $\lim_{x \to a} g(x) = g(a)$ for all real numbers a? How can you tell?

3. If you were given a polynomial p and asked to compute $\lim_{x \to a} p(x)$, how would you go about doing it. Check your answer with the box on page 102.

4. Let $f(x) = 3x^2$. Either follow the steps below or compute the difference quotient of f at 2 directly, that is find:
$$\lim_{h \to 0} \frac{f(2+h) - f(2)}{h}.$$

(a) Find $f(2+h)$, and simplify.

(b) Find $f(2)$.

(c) Use (a) and (b) to find $\dfrac{f(2+h) - f(2)}{h}$.

(d) Find $\displaystyle\lim_{h \to 0} \frac{f(2+h) - f(2)}{h}$.

5. Let $g(x) = x^2 - 2x$. Either follow the steps below or compute the difference quotient of g at 1 directly, that is find:
$$\lim_{h \to 0} \frac{g(1+h) - g(1)}{h}.$$

(a) Find $g(1+h)$, and simplify.

(b) Use (a) to find $\dfrac{g(1+h) - f(1)}{h}$.

(c) Find $\displaystyle\lim_{h \to 0} \frac{f(1+h) - f(1)}{h}$.