9.2 Close Enough (Limits)

Practice Tasks

I. Concepts and Procedures

1. When we write $\lim_{x \to a} f(x) = L$ then, roughly speaking, the values of $f(x)$ get closer and closer to the number ________ as the values of x get closer and closer to ______.

2. Use a table to determine the following:

a. $\lim_{x \to 4} \frac{\sqrt{x}-2}{x-4}$

x							
f(x)							

b. $\lim_{x \to 2} \frac{x-2}{x^2+x-6}$

x							
f(x)							

c. $\lim_{x \to \frac{1}{2}} \frac{x}{2x-1}$

x							
f(x)							

d. $\lim_{x \to 0} \frac{e^x-1}{x}$

x							
f(x)							

e. $\lim_{x \to 0} \frac{\sin x}{x}$

x							
f(x)							

3. Use your graphing calculator to determine $\lim_{x \to \frac{1}{2}} \frac{x}{2x-1}$. Include a sketch of the graph of the function.

4. Use direct substitution and the properties of limits to evaluate each of the following.

   a. $\lim_{x \to 4} \frac{3x+4}{2x-5}$

   b. $\lim_{x \to 3} 2x^2 + x + 1$

   c. $\lim_{x \to 3} \frac{x^2-9}{x-3}$

5. Use any method to evaluate each of the following.

   a. $\lim_{x \to 2} \begin{cases} 5 - x; x \leq 2 \\ 2x - 3; x > 2 \end{cases}$

   b. $\lim_{x \to 4} \frac{x^2+3x-40}{x-5}$

   c. $\lim_{x \to 4} \sqrt{4x + 9}$

II. Reasoning

1. Graphing Calculator Pitfalls

   a. Evaluate $h(x) = \frac{\tan x - x}{x^3}$ for $x = 1, 0.5, 0.1, 0.05, 0.01$, and 0.005.

   b. Guess the value of $\lim_{x \to 0} \frac{\tan x - x}{x^3}$.

   c. Evaluate $h(x)$ for successively smaller values of x until you finally reach 0 values for $h(x)$. Are you still confident that your guess in part (b) is correct? Explain why you eventually obtained 0 values.

   d. Graph the function h in the viewing window [-1,1]. Then zoom in toward the point where the graph crosses the y-axis to estimate the limit of $h(x)$ as x approaches 0. Continue to zoom in until you observe distortions in the graph of h. Compare with your results in part (c).