MATH 111: CALCULUS
HOMEWORK DUE FRIDAY WEEK 2

Make sure to review the homework instructions in the syllabus before writing your solutions. In particular, show your work and write in complete sentences (but also aim for concise explanations).

Problem 1. Fill out the Google Form at forms.gle/9RqMd7NB3tnYqdHSA.

Problem 2. Consider the function
$$f(x) = \frac{x^2 - 4}{|x - 2|}.$$

(a) Use a calculator or computer to fill in the following table:

x	$f(x)$
1.9	
1.99	
1.999	
2.001	
2.01	
2.1	

(b) What does the table tell you about the value of
$$\lim_{x \to 2} f(x)?$$

(c) What about
$$\lim_{x \to 2^+} f(x) \qquad \text{and} \qquad \lim_{x \to 2^-} f(x)?$$

(d) (bonus) Can you use some algebra to explain why your answer makes sense?

Problem 3. Consider the function
$$g(x) = \frac{1 - \frac{2}{x}}{x^2 - 4}.$$

(a) Use a calculator or computer to fill in the following table:

x	$g(x)$
1.9	
1.99	
1.999	
2.001	
2.01	
2.1	

(b) What does the table tell you about the value of
$$\lim_{x \to 2} g(x)?$$

Problem 4. Consider the function

$$h(x) = \frac{\sin x}{x}.$$

(a) Use desmos to sketch the graph of $y = h(x)$.

(b) What does your graph indicate about the values of

$$\lim_{x \to \infty} h(x) \qquad \text{and} \qquad \lim_{x \to -\infty} h(x)?$$

(c) What does your graph indicate about the value of

$$\lim_{x \to 0} h(x)?$$

(d) Use your answer to (c) to approximate the value of $\sin(0.001)$ without using a calculator.