Assignment 11 (10/27)

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Problem 1

Problems 2.4.$(29, 45, 46, 47, 48, 54, 56)$.

Problem 2

Use the fact that $\lim_{x\to 0} \frac{\sin(x)}{x} = 1$ to evaluate the following limits when it exists: 2.5.$(4, 8, 11, 14, 17, 21, 28, 32)$.

Problem 3

Read the proof of theorem 2.5.5 from book. Use the fact that $\lim_{x\to 0} \frac{1-\cos(x)}{x} = 0$ to find

$$\lim_{x\to 2} \frac{1-\cos(3x^2-5x-2)}{x^2-4}.$$

Problem 4

Problem 2.5.$(43, 45, 46, 47, 48, 50)$.

Problem 5

Def: The *greatest integer function*, sometimes also known as the *box function*, is defined as follows:

$$[x] = \text{ the greatest integer less than or equal to } x.$$

Thus, for example, $[1.2] = 1, [7.4] = 7, [5] = 5, [-0.1] = -1, [-2] = -2$ etc.

1. Draw a graph of the function $[x]$. What are the points of discontinuity for this function? Is the function left continuous, right continuous or neither at those points?
2. Does $\lim_{x\to 0}[x]$ exist?
3. What about $\lim_{x\to 0}[x][x+1]$?
4. Let $a > 0$ be some constant. Find

$$\lim_{x\to a^-} \left(\frac{|x|^3}{a} - \left[\frac{x}{a}\right]^3 \right)$$