

Homework 13

Math 171H (section 201), Fall 2023

This homework is due on **Tuesday, November 14** at the start of class. (Turn in answers to questions 1–6.)

0. Read Section 4.7

1. Compute the following limits:

(a) $\lim_{x \rightarrow 0^+} \frac{\ln x}{x}$

(b) $\lim_{t \rightarrow \infty} \frac{10^t - 3^t}{t}$

(c) $\lim_{t \rightarrow 0} \frac{10^t - 3^t}{t}$

(d) $\lim_{x \rightarrow 0^+} x^{\sqrt{x}}$

(e) $\lim_{t \rightarrow \infty} t - \ln t$

2. Sketch graphs of the following functions (show your work):

(a) $x(x - 4)^3$

(b) $\frac{(x-1)^2}{x^2+1}$

(c) $\frac{x}{x^3-1}$

3. (a) Graph $f(x) = \cos x$ with domain $[-2\pi, 2\pi]$ (from memory or using a graphing calculator).

(b) Mark and label all extrema (local and global) and inflection points.

(c) Use derivative tests to confirm your answers to (b).

4. Find two numbers whose difference is 10 and whose product is as small as possible.

5. Find the dimensions of a rectangle with perimeter 10 inches, for which the area is as large as possible.

6. Find the point on the line $y = 3x - 2$ that is closest to the origin.