

# Homework 4

Math 147, Fall 2017

This homework is due on Thursday, September 21. *Hint:* If you do not have a graphing calculator, you can use this one online: <https://www.desmos.com/calculator>

0. Read Sections 3.2, 3.3, 3.4

1. For each of the following functions  $h(x)$ , determine the domain and where (at which points) the function is continuous. Additionally, find functions  $f(x)$  and  $g(x)$  such that  $h(x) = f \circ g(x)$ . Recall that  $f \circ g(x) := f(g(x))$ .

(a)  $h(x) = \cos\left(\frac{x^2-3}{1-x}\right)$

(b)  $h(x) = \log_3(1-x)$

2. Section 1.2 # 18

3. Are there real numbers  $a$  and  $b$  for which the following function  $f(x)$  is continuous? If so, then determine  $a$  and  $b$ , and sketch a graph of  $f(x)$ . If not, then explain why not.

$$f(x) = \begin{cases} -1 & \text{if } x \leq -1 \\ ax + b & \text{if } -1 < x < 1 \\ 5 & \text{if } x \geq 1 \end{cases}$$

4. Evaluate the following limits. Show your work.

(a)  $\lim_{x \rightarrow \infty} -3x^5 + 6x$

(b)  $\lim_{x \rightarrow -\infty} xe^{-x}$

(c)  $\lim_{x \rightarrow \infty} \frac{3x^3 + 2x^5 - 1}{-x^2 + 5}$

(d)  $\lim_{x \rightarrow \infty} \frac{x^5 + 8}{-2x^2 + 6x^3}$

(e)  $\lim_{x \rightarrow 0^-} \frac{\cos x}{x}$

(f)  $\lim_{x \rightarrow 0} \frac{\cos x}{x}$

(g)  $\lim_{x \rightarrow 0} 2x^3 \cos x$

(h)  $\lim_{x \rightarrow \infty} \frac{\sin x}{x^3 + 6}$

5. Section 3.2 # 8, 28, 48

6. Section 3.3 # 20, 28

7. Section 3.4 # 4, 10, 12, 16

8. (These problems are *not* to be turned in!)

(a) Section 1.2 # 16

(b) Section 3.2 # 5, 7, 11, 15, 20, 23, 41, 45

(c) Section 3.3 # 1, 3, 5, 8, 13, 21, 25, 29

(d) Section 3.4 # 2, 5, 11, 13, 15, 17

9. (These problems are *not* to be turned in!) For each function below, determine the value(s) (if any) of  $a$  that make  $f(x)$  continuous.

(a)

$$f(x) = \begin{cases} a & \text{if } x \leq \pi \\ \cos x & \text{if } x > \pi \end{cases}$$

(b)

$$f(x) = \begin{cases} e^x & \text{if } x < 0 \\ ax & \text{if } x \geq 0 \end{cases}$$