

Midterm 1
Practice Exam
31 January 2020

Instructions:

- Duration of exam: 50 minutes.
- Only scientific (non-programmable) calculators are permitted.
- No notes/books are permitted
- You need to respond entirely on the pages given.
- The value of each question is noted to the right of the question.
- The solution to each question is worth 1 point; showing your work is worth the rest of the points.

1. (10 Points) Let $g(x) = x - 8$ and $f(x) = \frac{1}{x^2}$.
- (a) What is $(f \circ g)(x)$?
 - (b) What is the domain of $(f \circ g)(x)$? (why?)
 - (c) What is the range of $(f \circ g)(x)$? (why?)
 - (d) Is $(f \circ g)(x)$ even, odd, neither, or both? (why?)

2. (15 Points) Find the following limits. If the limit does not exist, explain why.

(a)

$$\lim_{x \rightarrow 0} -\frac{1}{x} + \frac{2}{\sqrt{x+4x}}$$

(b)

$$\lim_{x \rightarrow \infty} \frac{\sqrt{4x^2 + 2x + 3}}{3x}$$

3. (15 Points) Find the following limits. If the limit does not exist, explain why.

(a)

$$\lim_{x \rightarrow 0^+} \frac{14 \sin(x) + 1}{x^3}$$

(b)

$$\lim_{x \rightarrow 0^-} \frac{14 \sin(x) + 1}{x^3}$$

(c)

$$\lim_{x \rightarrow 0} \frac{14 \sin(x) + 1}{x^3}$$

4. (10 Points) Find the following limit using the squeeze theorem.

$$\lim_{x \rightarrow +\infty} \frac{\cos(2x)^2}{3x - 7}$$

5. (15 Points) Show that the following function is continuous at $a = 2$ using the three requirements we went over in class.

$$f(x) = \frac{x^2 + 3x}{3x + 14}$$