Calculus 1 — Exam 1 MAT 250, Spring 2017 — D. Ivanšić

Name:

Show all your work!

1. (16pts) Use the graph of the function to answer the following. Justify your answer if a limit does not exist.

$$\lim_{x \to -3+} f(x) =$$

$$\lim_{x \to 2^-} f(x) =$$

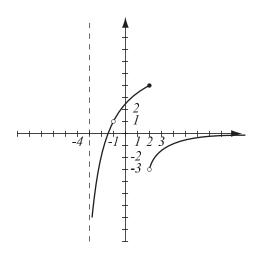
$$\lim_{x \to 2^+} f(x) =$$

$$\lim_{x \to 2} f(x) =$$

$$\lim_{x \to -1} f(x) =$$

$$\lim_{x \to \infty} f(x) =$$

List points where f is not continuous and justify why it is not continuous at those points.



2. (6pts) Let $\lim_{x\to 3} f(x) = 2$ and $\lim_{x\to 3} g(x) = -1$. Use limit laws to find the limit below and show each step.

$$\lim_{x\to 3} \sqrt{x^3f(x)-\frac{10}{g(x)}} =$$

3. (10pts) Find $\lim_{x\to 0} x^2 \cdot \sqrt{7 + \sin\left(\frac{1}{x}\right)}$. Use the theorem that rhymes with honey-producing insects.

Find the following limits algebraically. Do not use the calculator.

4. (5pts)
$$\lim_{x \to 5} \frac{x^2 - 5x}{x^2 - 3x - 10} =$$

5. (7pts)
$$\lim_{x\to 2} \frac{3-\sqrt{x+7}}{x-2} =$$

6. (7pts)
$$\lim_{x\to 0} \frac{\tan(2x)}{x} =$$

7. (7pts)
$$\lim_{x \to \infty} \frac{3x^2 - 5x + 4}{x^3 - 4x^2 + x - 7} =$$

8. (6pts)
$$\lim_{x\to 2^+} \frac{x-6}{4-2x} =$$

- **9.** (14pts) The equation $x^2 + 4x = 2^x + 5$ is given.
- a) Use the Intermediate Value Theorem to show it has a solution in the interval (0,3).
- b) Use your calculator to find an interval of length at most 0.01 that contains a solution of the equation. Then use the Intermediate Value Theorem to justify why your interval contains the solution.

10. (10pts) Consider the limit $\lim_{x\to 1} \frac{\log x}{x-1}$. Use your calculator (careful with entering the denominator!) to estimate this limit with accuracy 4 decimal points. Write a table of values that will justify your answer.

x	$\frac{\log x}{x-1}$	x	$\frac{\log x}{x-1}$

11. (12pts) Consider the function defined below. Find a value for c that makes the function continuous.

$$f(x) = \begin{cases} x^2 + \frac{cx}{16}, & \text{if } x \le 4\\ \frac{cx - 4c}{x^2 - 16}, & \text{if } x > 4. \end{cases}$$

Bonus. (10pts) Find the limit algebraically.

$$\lim_{x \to \infty} (\sqrt{x^2 + 5x + 2} - x)$$