## Calculus 1 - Exam 1 <br> 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.
$\lim _{x \rightarrow-3+} f(x)=$
$\lim _{x \rightarrow 2^{-}} f(x)=$
$\lim _{x \rightarrow 2^{+}} f(x)=$
$\lim _{x \rightarrow 2} f(x)=$
$\lim _{x \rightarrow-1} f(x)=$
$\lim _{x \rightarrow \infty} f(x)=$
List points where $f$ is not continuous and justify why it is not continuous at those
 points.
2. (6pts) Let $\lim _{x \rightarrow 3} f(x)=2$ and $\lim _{x \rightarrow 3} g(x)=-1$. Use limit laws to find the limit below and show each step.
$\lim _{x \rightarrow 3} \sqrt{x^{3} f(x)-\frac{10}{g(x)}}=$
3. (10pts) Find $\lim _{x \rightarrow 0} x^{2} \cdot \sqrt{7+\sin \left(\frac{1}{x}\right)}$. Use the theorem that rhymes with honey-producing insects.

Find the following limits algebraically. Do not use the calculator.
4. (5pts) $\lim _{x \rightarrow 5} \frac{x^{2}-5 x}{x^{2}-3 x-10}=$
5. $(7 \mathrm{pts}) \lim _{x \rightarrow 2} \frac{3-\sqrt{x+7}}{x-2}=$
6. (7pts) $\lim _{x \rightarrow 0} \frac{\tan (2 x)}{x}=$
7. $(7 \mathrm{pts}) \lim _{x \rightarrow \infty} \frac{3 x^{2}-5 x+4}{x^{3}-4 x^{2}+x-7}=$
8. (6pts) $\lim _{x \rightarrow 2^{+}} \frac{x-6}{4-2 x}=$
9. (14pts) The equation $x^{2}+4 x=2^{x}+5$ 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 $\lim _{x \rightarrow 1} \frac{\log x}{x-1}$. 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.
$f(x)= \begin{cases}x^{2}+\frac{c x}{16}, & \text { if } x \leq 4 \\ \frac{c x-4 c}{x^{2}-16}, & \text { if } x>4 .\end{cases}$

Bonus. (10pts) Find the limit algebraically.
$\lim _{x \rightarrow \infty}\left(\sqrt{x^{2}+5 x+2}-x\right)$

