Name: _____ Academic Integrity Signature: _____
I have abided by the UNCG Academic Integrity Policy.

Read all of the following information before starting the exam:

- It is to your advantage to answer ALL of the questions.

- It is your responsibility to make sure that you have all of the problems.

- There is no need to complete the test in order. The problems are independent.

- Duey has evil level 3, Pepsi has evil level 4, and Rusty has evil level 9.

- Correct numerical answers with insufficient justification may receive little or no credit.

- Clearly distinguish your final answer from your scratch work with a box or circle.

- *Budget your time!*

- If you have read all of these instructions, draw a happy face here.

Page:	1	2	3	4	5	Total
Points:	25	15	25	25	10	100
Score:						

1. (15 points) Let $f(x) = x^3 + 2x - 3$. Find the average rate of change of $f(x)$ over the interval $[1, 2]$.

2. (10 points) Use the Intermediate Value Theorem to show that $x - \cos(x) = 0$ at some point x in the interval $[0, \frac{\pi}{2}]$.

3. (15 points) Answer the following questions about $f(x)$. The entire graph of $f(x)$ is shown here. The axes that are shown are the x and y axes.
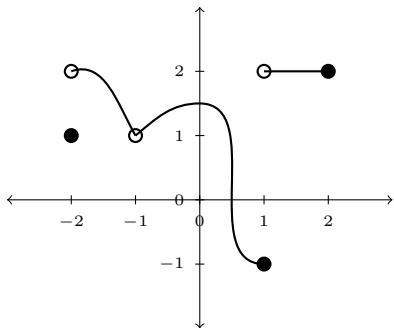
(a) What is $\lim\limits_{x \to -2^+} f(x)$?

(b) What is $\lim\limits_{x \to -1^-} f(x)$?

(c) What is $\lim\limits_{x \to -1} f(x)$?

(d) What is $\lim\limits_{x \to 1^+} f(x)$?

(e) Does $\lim\limits_{x \to 1} f(x)$ exist? Explain.

(f) Is $f(x)$ continuous at $x = -1$? Explain.

(g) Is $f(x)$ continuous at $x = 0$? Explain.

(h) Is $f(x)$ continuous at $x = 1$? Explain.

Points earned: _____ out of 15.

4. (10 points) Find a number δ so that every number x in the interval $|x - \frac{1}{2}| < \delta$ also satisfies $|(6x - 2) - 1| < \frac{1}{10}$. Note: The definition of $\lim_{x \to \frac{1}{2}} (6x - 2) = 1$ tells you that you can solve this problem.

(Hint: Work backwards to find δ. You want $|(6x - 2) - 1| < \frac{1}{10}$, so figure out which x-values make this true.)

5. (15 points) Let $f(x) = \dfrac{x^2}{2x - 10}$.

   (a) Evaluate $\lim_{x \to 5^-} f(x)$.

   (b) Evaluate $\lim_{x \to 5^+} f(x)$.

   (c) Does the graph $y = f(x)$ have a vertical asymptote? If it does, give the formula for the vertical asymptote.

Points earned: _____ out of 25.

6. (10 points) Let $f(x) = \dfrac{3x^2 + 2x - 13}{7x^3 + 23x^2 + x - 1}$.

   (a) Evaluate $\lim\limits_{x \to \infty} f(x)$.

   (b) Does the graph $y = f(x)$ have a horizontal asymptote? If it does, give the formula for the horizontal asymptote.

7. (15 points) Evaluate the following limits

   (a) $\lim\limits_{y \to -1} \dfrac{y + 1}{y^2 + 3y + 2}$

   (b) $\lim\limits_{x \to 0^+} \dfrac{x + 2 - \sqrt{x}}{\cos(x)}$

8. (10 points) For what value of a is

$$f(x) = \begin{cases} x^2 + 3 & \text{if } x < 3, \\ 2ax & \text{if } x \geq 3 \end{cases}$$

continuous at $x = 3$?