Name: _

Math 151-01, Calculus I – Crawford

	Score	
	1	/12
	2	/14
	3	/12
any unautho-	4	/14
	5	/8
written work.	6	/12
	7	/8
	8	/8
	9	/14
	Total	/100

- Calculators, books, notes (in any form), cell phones, and any unauthorized sources are <u>not</u> allowed.
- You may use the provided unit circle.
- Clearly indicate your answers.
- Show all your work partial credit may be given for written work.
- Good luck!

1. (12 pts). Apply the Mean Value Theorem to the function $f(x) = \frac{1}{x}$ on the interval [1,3] and find all values of c that satisfy the MVT.

2. (14 pts). Find the <u>absolute</u> maximum and minimum <u>values</u> of $f(x) = (x^2 - 1)^3$ on the interval [-1, 2].

3. (12 pts). Find the critical numbers of $g(\theta) = 4\theta - \tan \theta$ for $0 \le \theta \le 2\pi$.

4. (14 pts). Given $f(x) = \frac{4x-5}{x^2}$,

(a). Find the intervals on which f is increasing or decreasing.

(b). Find all local maximum and minimum <u>values</u>.

5. (8 pts). The graph of the *second derivative* f''(x) is given below.



(a). On which intervals is the *function* f (not the second derivative) concave upward or concave downward?

(b). State the x-coordinate(s) of the inflection point(s) of the *function* f.

6. (12 pts). Given the equation $\cos x = 3x^2 - x$,

(a). Explicitly write out Newton's formula for finding the root of this equation.

(b). Start with an initial guess of $x_0 = 1.5$ and iterate Newton's method to find x_1 . [Do not simplify your answer!]

7. (8 pts). Evaluate the following limit. [Show all your work - no shortcuts.]

$$\lim_{x \to -\infty} \frac{4 - 3x - 2x^3}{3x^3 - x + 1}$$

8. (8 pts). Determine the slant asymptote of $f(x) = \frac{3x^2 + 1}{x - 2}$. [Do not sketch the curve.]

9. (14 pts). A zoo needs to add a rectangular outdoor pen to an animal house with a corner notch [See figure below]. Fencing will be used to divide the pen into two regions as shown. For the health of the animals, the *total* area of the outdoor pen must be 800 square meters. What dimensions of the pen will minimize the amount of fencing used?

[Note: No fence will be used along the walls of the animal house.]

