Name: _____ **Exam 3**

Math 151, Calculus I – Crawford **02 May 2017**

- Calculators, books, notes (in any form), cell phones, and any unauthorized sources are ***not*** allowed.
- Clearly indicate your answers.
- ***Show all your work*** – partial credit may be given for written work.
- ***Good luck***!

The following formulas may or may not be helpful.

$$\sum_{i=1}^{n} c = cn \qquad \sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

$$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6} \qquad \sum_{i=1}^{n} i^3 = \left[\frac{n(n+1)}{2}\right]^2 = \frac{n^2(n+1)^2}{4}$$

	Score
1	/6
2	/8
3	/8
4	/10
5	/14
6	/10
7	/8
8	/24
9	/6
10	/10
Total	/100

1. (6 pts). Evaluate the following limit. [Show all algebraic work to justify your answer - no shortcuts.]

$$\lim_{x \to -\infty} \frac{2 - 3x + x^2}{6x^2 - 2}$$

2. (8 pts). Given the equation $2x^3 - 3x^2 - 5 = 0$

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

(b). Start with an initial guess of $x_0 = 2$ and iterate Newton's method to find x_1. [Do not simplify.]

3. (8 pts). Determine the slant asymptote of the following function.

$$f(x) = \frac{8x^3 + 2x^2 + 6}{2x^2}$$

4. (10 pts). Given $f(x) = \dfrac{1}{x}$ on the interval $[1, 4]$,

(a). What two conditions on f must be satisfied for the Mean Value Theorem apply?

(b). Find all numbers c that satisfy the conclusion of the Mean Value Theorem.

5. (14 pts). A homeowner has 120 feet of fencing to create a rectangular pen for his two dogs. The rectangular area will be divided in half with a fence parallel to one of the sides. What are the dimensions of the overall rectangular region that will yield the maximum area enclosed?

6. (10 pts). Using the definition of the definite integral $\int_a^b f(x)\,dx = \lim_{n\to\infty}\sum_{i=1}^{n} f(x_i)\Delta x$,

set-up, but do not evaluate, the summation/limit using right endpoints for the following integral.

$\int_1^5 x - x^4\,dx$

7. (8 pts). Evaluate the following limit.

$\lim_{n\to\infty}\sum_{i=1}^{n}\left(\frac{2}{n}i\right)\cdot\frac{2}{n}$

8. (24 pts). Evaluate the following integrals. [Use integration techniques, ***NOT*** the limit definition.]

(a). $\displaystyle\int x^2 - 3x + \frac{4}{x^3}\, dx$

(b). $\displaystyle\int_1^2 (3x+2)(x-1)\, dx$ [Simplify.]

(c). $\displaystyle\int x^3 \sec^2(x^4)\, dx$

9. (6 pts). Use the Fundamental Theorem of Calculus Part B/1 to find $F'(x)$ for

$$F(x) = \int_{\pi/4}^{x^3} \cos(t^2)\, dt$$

10. (10 pts). The velocity (m/sec) of a particle is given by $v(t) = 2t - 4$.

(a). Find the displacement over $0 \leq t \leq 3$.

(b). Find the total distance traveled over $0 \leq t \leq 3$.