Name: ______ Math 151, Calculus I – Crawford

	Score
1	/6
2	/8
3	/6
4	/12
5	/16
6	/8
7	/10
8	/22
9	/6
10	/10
Total	/100

- $\bullet\,$ Calculators, books, or notes (in any form) are $\underline{\textit{not}}$ 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.

$$\sum_{i=1}^{n} c = cn$$

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

$$\sum_{i=1}^{n} i^{2} = \frac{n(n+1)(2n+1)}{6}$$

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

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

 $\lim_{x\to\infty}\frac{4x^2+3x-1}{-5x^2+x}$

2. (8 pts). Determine the horizontal asymptote(s) or a slant asymptote of the following function.

$$f(x) = \frac{4x^3 + 2x - 1}{2x^2 + x}$$

3. (6 pts). Sketch a single function that satisfies all of the following conditions.



4. (12 pts). Given $f(x) = 4x^3 + 10x^2 - 5$

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

(b). Start with an initial guess of $x_0 = 1$ and iterate Newton's method to find x_1 .

[Simplify.]

(c). For what starting values of x_0 will Newton's Method fail to work.

5. (16 pts). A rectangular poster is to have an overall area of 150 in². The bottom and side margins are 1 inch. The top margin is 2 inches. What are the dimensions of the poster that will give the largest *printed* area?

6. (8 pts). $f(x) = 1 + x^2$, estimate the area under the graph from x = 0 to x = 6 using n = 4 rectangles and the right endpoint of each subinterval for the height of the rectangle. [Plug in all the appropriate values, but you do **NOT** need to simplify to a single value.]



7. (10 pts). Evaluate the following limit.

$$\lim_{n \to \infty} \sum_{i=1}^{n} \left[1 + \left(\frac{6}{n}i\right)^2 \right] \cdot \frac{6}{n}$$

8. (22 pts). Evaluate the following integrals. [Use integration techniques, <u>NOT</u> the limit definition.]

(a).
$$\int 1 + 3x^3 - 2\sqrt{x^3} \, dx$$

(b).
$$\int \cos x - \sec^2 x \, dx$$

(c).
$$\int_{1}^{2} \frac{2 - 3t^2 + 5t^4}{t^2} dt$$

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

$$F(x) = \int_3^{\sin x} \sqrt{t^2 + t} \, dt$$

10. (10 pts). The velocity of a particle is given by the graph below in mm/sec.



(a). Find the displacement over $0 \le t \le 10$.

(b). Find the total distance traveled over $0 \le t \le 10$.