MTH 151
Exam 4
Fall 2013

Show all work in a neat and organized fashion. Clearly indicate your answers.
100 points possible.

$$\int_a^b c\,dx = c(b-a) \qquad \int_a^b x\,dx = \frac{b^2}{2} - \frac{a^2}{2} \qquad \int_a^b x^2\,dx = \frac{b^3}{3} - \frac{a^3}{3}$$

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1. Find the following limit exactly. Provide all major algebraic/symbolic steps to justify that your answer is correct. Find the *exact* answer, with radical signs if necessary, not a decimal approximation.

$$\lim_{x\to+\infty} \frac{3x^2 - 5x + 6}{7x^2 + 8}$$

2. Find $f(x)$, given the following.

$$f'(x) = 2\sin x + 3\cos x, \qquad f(0) = 4$$

3. Use the formulas $\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$, $\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$, and $\sum_{i=1}^{n} i^3 = \frac{n^2(n+1)^2}{4}$ to find the indicated summation.

$$\sum_{i=-100}^{300} (i+2)$$

4. (a) If $h(x) = -3$, find $\int_2^6 h(z)\,dz$.

(b) Find $\int_3^3 \sec z\,dz$.

5. Find $\displaystyle\int_{-3}^{2} f(t)\,dt$ where $f(t) = \begin{cases} t^2, & \text{if } t < 0 \\ t, & \text{if } t \geq 0 \end{cases}$

6. Evaluate $\displaystyle\int_{-1}^{2} (20x^4 - 8x^3)\,dx$

7. Find $\int (2x+5)(x-1)\,dx$

8. Find $\int x^3 \sin(x^4)\,dx$

9. Find $\int x^2(x^3+10)^{-3/5}\,dx$

10. A farmer wants to fence an area of 1944 square meters in a rectangular field and then divide it in half with a fence parallel to one of the sides of the rectangle. What dimensions of the field will minimize the total length of fencing? Use calculus methods. Include work that justifies why your answer gives an absolute minimum.