Math 142, Final Exam, Fall 2013

Write everything on the blank paper provided. **You should KEEP this piece of paper.** If possible: return the problems in order (use as much paper as necessary), use only one side of each piece of paper, and leave 1 square inch in the upper left hand corner for the staple. If you forget some of these requests, don't worry about it – I will still grade your exam.

The exam is worth 100 points. Each problem is worth 10 points. Your work must be coherent, complete, and correct. $\boxed{CIRCLE}$ your answer. **CHECK** your answer whenever possible.

No Calculators or Cell phones.

1. Consider the region bounded by $y^2 - x = 1$ and $y - x + 1 = 0$. Rotate this region about the line $y = -2$. Find the volume of the resulting solid. **You must draw a meaningful picture.**

2. Does the series $\sum\limits_{n=1}^{\infty} \frac{2n+5}{3n^2+n}$ converge? **Justify your answer very thoroughly. Write in complete sentences.**

3. Where does the series $f(x) = \sum\limits_{n=0}^{\infty} \frac{(x-3)^n}{n2^n}$ converge? **Justify your answer very thoroughly. Write in complete sentences.**

4. Estimate $\int_0^{1/10} \sin(x^3)dx$ with an error at most 10^{-10}. **Justify your answer very thoroughly. Write in complete sentences.**

5. Find the second Taylor polynomial $T_2(x)$ about $a = 1$ for $f(x) = \sqrt{x}$.

6. Estimate the sum $\sum\limits_{n=1}^{\infty} \frac{1}{n^4}$ with an error at most $\frac{1}{3000}$. **Justify your answer very thoroughly. Write in complete sentences.**

7. Find $\int \sec^6 x \tan^4 x dx$. **Check your answer.**

8. Find $\int \sec x \tan^2 x dx$. **Check your answer.**

9. Find $\int \frac{3x^2+x}{(x+1)(x^2+1)} dx$. **Check your answer.**

10. Find $\int \frac{dx}{4x^2+24x+45}$. **Check your answer.**