Math 142, Final Exam, Spring 2016

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. Please make your work coherent, complete, and correct. Please $\boxed{CIRCLE}$ your answer. Please **CHECK** your answer whenever possible.

No Calculators or Cell phones.

1. Find $\int \sin^5 x\, dx$. **Please check your answer.**

2. Find $\int \dfrac{4x^3 + x^2 + x - 1}{x^2(x^2+1)}\, dx$. **Please check your answer.**

3. Find $\int \dfrac{1}{\sqrt{x^2+1}}\, dx$. **Please check your answer.**

4. Find $\int e^{2x} \cos 3x\, dx$. **Please check your answer.**

5. Find the area between $x + y^2 = 3$ and $x - y = 1$. **Please draw a meaningful picture.**

6. Estimate $\int_0^{1/10} \cos(x^3)\, dx$ with an error at most $\frac{1}{10^{10}}$. **Please explain your answer thoroughly.**

7. Does $\sum_{k=1}^{\infty} \dfrac{1}{k + k^2}$ converge? **Please explain your answer thoroughly.**

8. Consider the curve described the the system of parametric equations $\begin{cases} x = \sec t \\ y = \tan t. \end{cases}$ Find the equation of the line tangent to this curve at $t = 1$. **Please explain your answer thoroughly.**

9. Estimate $\sum_{k=1}^{\infty} \dfrac{1}{k^4}$ with an error at most $\frac{1}{1000}$. **Please explain your answer thoroughly.**

10. What familiar function is equal to $f(x) = 1 + 2x + 3x^2 + 4x^3 + 5x^4 + \ldots$? Where does this equality hold. **Please explain your answer thoroughly.**