Math 142, Final Exam , Fall 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 the area between $x + 1 = y^2$ and $y + 5 = x$. (Please draw a meaningful picture.)

(2) Find $\displaystyle\int \frac{1}{\sqrt{x}(\sqrt{x}+1)}\,dx$. (Please check your answer.)

(3) Find $\displaystyle\int \frac{1}{\sqrt{x^2+1}}\,dx$. (Please check your answer.)

(4) Find $\displaystyle\int e^{3x}\cos x\,dx$. (Please check your answer.)

(5) Find $\displaystyle\int \frac{3x^3+2x^2+x-1}{x^2(x^2+1)}\,dx$. (Please check your answer.)

(6) Let $f(x) = \displaystyle\sum_{n=1}^{\infty} \frac{(x-1)^n}{n2^n}$. Where does $f(x)$ converge? Where does $f(x)$ diverge? Justify your answer.

(7) What is the second Taylor polynomial $P_2(x)$ for $f(x) = \sqrt{x}$ about $a = 4$?

(8) Keep the notation of problem (7). Give an upper bound for the difference between $P_2(x)$ and $f(x)$ when $3.9 \leq x \leq 4.1$. Please explain what you are doing.

(9) Aproximate $\displaystyle\sum_{k=1}^{\infty} \frac{1}{k^4}$ with an error at most 10^{-3}.

(10) Does the series $\displaystyle\sum_{k=1}^{\infty} \frac{2k}{3k+4}$ converge? Justify your answer.