Math 142, Final Exam, Fall 2015

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.

No Calculators or Cell phones.

1. Find $\int \frac{x^2 - 6x + 12}{(x-2)^3} dx$. Please check your answer.

2. Find $\int \sec^6 x dx$. Please check your answer.

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

4. Find $\int \frac{1}{x^2 + 2x + 2} dx$. Please check your answer.

5. Consider a solid wedge cut from a cylinder of radius three. The base of the cylinder sits in the xy-plane centered at the origin. The top of the wedge is a plane which intersects the xy plane along the y-axis. The top of the wedge and the bottom of the wedge meet at an angle of 60 degrees. Find the volume of the wedge. Please draw something meaningful.

6. Find the volume of the solid obtained by rotating the region bounded by $y = x^2$, the x-axis, and $x = 1$ about $x = 1$. Please draw something meaningful.

7. Write the repeating decimal $216.\overline{315} = 216.315315315\ldots$ as a ratio of two integers.

8. Does the sum $\sum_{k=1}^{\infty} \frac{k}{e^k}$ converge? Please justify your answer very thoroughly.

9. Does the sum $\sum_{k=1}^{\infty} \frac{1}{k+\sqrt{k}}$ converge? Please justify your answer very thoroughly.

10. What is the second Taylor polynomial $T_2(x)$ centered about $c = 0$ for $f(x) = e^x$?