Math 242, Final Exam, Spring 2013

Write everything on the blank paper provided. **You should KEEP this piece of paper.** If possible: turn 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. **Your work must be coherent and correct. You are strongly encouraged to make sure that your answers are correct.** $\boxed{CIRCLE}$ **your answer. No Calculators or Cell phones.**

1. (17 points) Solve the initial value problem $y'' - 3y' + 2y = e^x$, $y(0) = 3$, and $y'(0) = 4$. Express your answer in the form $y = y(x)$.

2. (17 points) Find the general solution of $y' - \frac{2y}{x} = -x^2y^2$. Express your answer in the form $y = y(x)$.

3. (17 points) Find the general solution of $xy' = y + 2\sqrt{xy}$. Express your answer in the form $y = y(x)$.

4. (17 points) Find the general solution of $\frac{dy}{dx} = 3y - y^2$. Express your answer in the form $y = y(x)$.

5. (16 points) Find a non-trivial solution of $tx''+2(t-1)x'-2x = 0$ with $x(0) = 0$. Express your answer in the form $x = x(t)$.

6. (16 points) Find $\mathcal{L}^{-1}(\ln \frac{s-2}{s+2})$. Express your answer in the form $f = f(t)$.