

Math 242, Final Exam, Spring, 2018

- I expect correct answers.
- I expect high quality work. Your work should be coherent, complete, and correct.
- Please CIRCLE your answer.
- The exam is worth 100 points. Each problem is worth 20 points.

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.

No Calculators or Cell phones.

- (1) A 120-gallon tank initially contains 180 lb of salt dissolved in 90 gal of water. Brine containing 3 lb of salt per gallon flows into the tank at the rate of 3 gal/min and the well-mixed mixture flows out of the tank at the rate of 4 gal/min. How much salt is in the tank at each moment?
- (2) Solve $y'' - 6y' + 25y = 0$. (In this problem $y = y(x)$.)
- (3) Solve the initial value problem $y'' - 5y' + 6y = e^{2x}$, $y(0) = 1$, $y'(0) = 2$. (In this problem $y = y(x)$.)
- (4) Find the inverse Laplace transform of $F(s) = \frac{s+1}{(s^2+2s+10)^3}$.
- (5) Find a non-trivial solution of the differential equation $tx'' + 2(t-1)x' - 2x = 0$ with $x(0) = 0$. (In this problem $x = x(t)$.)