

Math 242, Final Exam, Spring 2017, 1:15 Class

Write everything on the blank paper provided. **You should RETURN this piece of paper to me.** 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.

Please make your work coherent, complete, and correct.

Please CIRCLE your answer.

Please CHECK your answer whenever possible.

No Calculators or Cell phones.

- (1) (15 points) Suppose that the only force acting on an object is resistance and resistance is proportional to velocity. Suppose further that the object is traveling at 100 feet per second when it is first sighted and is traveling at 70 feet per second 10 seconds later. How far will the object have traveled between the two sightings?
- (2) (15 points) Consider a tank with 200 liters of salt-water solution, 30 grams of which is salt. A brine solution which contains one gram of salt per liter of solution is pouring into the tank at a rate of 4 liters per minute. The “well-mixed” solution pours out at a rate of 5 liters/minute. Write an Initial Value Problem whose solution is the amount of salt in the tank at time t . **You do not have to solve the Initial Value Problem.**
- (3) (14 points) Find the general solution of $x^2 - y^2 + xy \frac{dy}{dx} = 0$.
- (4) (14 points) Find the general solution of $\frac{d^2y}{dx^2} + 16y = \cos(2x)$.
- (5) (14 points) Find $\mathcal{L}(\cos^2 x)$.
- (6) (14 points) Find $\mathcal{L}^{-1}\left(\frac{2s+1}{s^2+s-2}\right)$.
- (7) (14 points) Find $\mathcal{L}^{-1}\left(\frac{s}{(s^2+1)^3}\right)$.