Math 242 Test 1, Tuesday 10 February

Name:

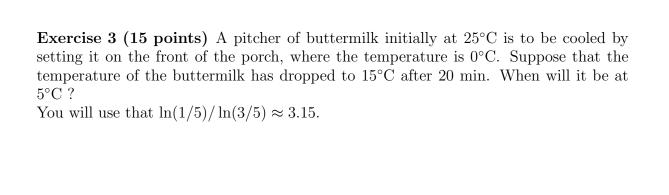
Last 4 digits of SSN:

Show all work clearly. No work means no credit. The points are: ex1: 10, ex2: 10, ex3: 15, ex4: 15, ex5: 20, ex6: 15, ex7: 15.

Exercise 1 (10 points) A ball is thrown straight downward from the top of a tall building. The initial speed of the ball is 10 m/s. It strikes the ground with a speed of 60 m/s. How tall is the building? You will take $g = 10 \ m/s^2$.

Exercise 2 (10 points) Solve the differential equation:

$$3x^5y^2 + x^3y' = 2y^2.$$



Exercise 4 (15 points) We are considering the following differential equation:

$$xy' = 4y + x^4 \cos x.$$

Solve this equation with the initial value $y(\pi) = 0$.

Exercise 5 (20 points) We consider the following differential equation:

$$x^3y' = x^2y - y^3, \ x > 0.$$

- 1. What kind of equation is it?
- 2. What substitution do we have to do?
- 3. What kind of differential equation do we obtain after the substitution?

4. Solve this last differential equation and then find the expression of y.

Exercise 6 (15 points) We consider the following differential equation:

$$e^{y} + y \cos x + (xe^{y} + \sin x) y' = 0.$$

1. Show that this equation is exact.

2. Then solve this differential equation.

Exercise 7 (15 points) We consider the following differential equation:

$$-xy + x^2y' = y^2 + x^2.$$

- 1. Write this differential equation as a homogeneous one.
- 2. Then solve this differential equation.