

Math 242 Test 1, Friday 19 September

Name:

Last 4 digits of SSN:

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

Exercise 1 The skid marks made by an automobile indicated that its brakes were fully applied for a distance of 75 m before it came to a stop. The car in question is known to have a ***constant deceleration*** of 20 m/s^2 under these conditions.

1. Find the expression of the motion of the automobile when the brakes started (take v_0 for initial velocity).
2. How fast - in m/s - was the car traveling when the brakes were first applied ?
(You will use that $\sqrt{40 * 75} = 10\sqrt{30}$)

Exercise 2 Solve the differential equation :

$$xy^2 + 3y^2 - x^2y' = 0.$$

Exercise 3 We are considering the following differential equation:

$$2x^2y + x^3y' = 1.$$

1. On which intervals does there exist a unique solution?
2. Solve the equation with the initial value $y(1) = 3$.

Exercise 4 We consider the following differential equation:

$$3y + x^3y^4 + 3xy' = 0.$$

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 5 We consider the following differential equation:

$$2xy^3 + e^x + (3x^2y^2 + \sin y) y' = 0.$$

1. Show that this equation is exact.
2. Then solve this differential equation.

Exercise 6 We consider the following differential equation:

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

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