

Directions: Work all four questions. Hand in any scratch work that you want graded. If you need help with a derivative or integral, ask me.

1. Solve the initial value problem

$$y'' - 6y' + 9y = 0, \quad y(0) = 0, \quad y'(0) = 2.$$

2. The time rate of change of a rabbit population is proportional to the square root of the population. At time $t = 0$, the population is 100 rabbits and is increasing at a rate of 20 rabbits per month. How many rabbits will there be one year later?

3. Determine whether the equation

$$(e^x \sin y - 2y \sin x) dx + (e^x \cos y + 2 \cos x) dy = 0$$

is exact. If it is exact, find the solution.

4. Find the general solution of the equation

$$y'' + 8y' + 25y = 0.$$