Math 1B: Discussion 4/16/19

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Question 1: Review

Find all solutions of

$$e^{-x}\frac{dy}{dx} = (y+2)(x^2+2x+1)$$

Then, find the particular solution that passes through the point (-1, 2).

Find the orthogonal trajectories of the family of curves

$$\arctan(x) + \ln(1+y^3) = C$$

An ant population grows logistically according to the differential equation

$$\frac{dP}{dt} = 0.1P\left(1 - \frac{P}{5000}\right)$$

where t is time in days. Suppose it takes 10 days for the population to double in number from its initial population at $t = 0$. Find the time at which the population will reach 90 percent of its carrying capacity.

Question 2

Solve the following linear ordinary differential equations.

$$\frac{dy}{dx} + xy = -x^3$$

$$\frac{dy}{dx} + \frac{y}{x} = \cos(x)$$

$$\frac{dy}{dx} + \frac{y}{2x} = x + \frac{1}{x\sqrt{x}}$$

$$\frac{dy}{dx} + \frac{2xy}{1+x^2} = e^x$$

$$\frac{dy}{dx} + \frac{y}{\arctan(x)(1+x^2)} = x$$