AMS 361: Applied Calculus IV

Homework 3

Assignment Date: **Friday (01/15/2021) 2:00 PM**
Collection Date: **Thursday (01/21/2021) Before 2:30pm**
Email Address: **TO:** charutamanikra.bamane@stonybrook.edu
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Grades: **4** problems are worth **100 points**.

Student ID:		
Student Name:		
Problems	Score	Remarks
3.1		
3.2		
3.3		
3.4		
Total Score:		

Problem 3.1 (25 points): An outbreak of COVID-19, a highly contagious disease, is ravaging through all over the world. We hypothesize: a patient is diagnosed to be have contracted P_0 COVID-10 viruses at time $t = 0$ and these viruses "multiple" subsequently according $P'(t) = -\alpha P(M - P)$ where $P(t)$ is number of viruses at time t while $\alpha > 0$ and $M > 0$ are constants. The patient will die when $P(t) \to \infty$. If $P_0 > M$, the patient's prognosis, i.e., the time T_p is has left to live, is short. Derive a formula for T_p and for given $P_0 = 1000, M = 100, \alpha = 0.001$. Compute the value of T_p.

Problem 3.2 (25 points): Find the PS of the following IVP:

$$\begin{cases} y'' - y' - 2y = 0 \\ y(0) = 1, y'(0) = 2 \end{cases}$$

Problem 3.3 (25 points): Find the GS of the DE:

$$x^2y'' - 3xy' + 4y = 0$$

Hint: substitute $x = \exp t$.

Problem 3.4 (25 points): Solving the DE using the exact DE method:

$$y' = -\frac{4x^2 + 3y^2}{2xy}$$

Reference to the Textbook is suggestive. Homework problems are not identical to those in the book but the solution methods are similar.