MATH 101 V01 – ASSIGNMENT 9

There are two parts to this assignment. The first part is on WeBWorK — link to it using Canvas, and go to MATH 101.V01 (after 9:00 am Friday, March 23). The second part consists of the questions on this page. You are expected to provide full solutions with complete justifications. You will be graded on the mathematical, logical and grammatical coherence and elegance of your solutions. Your solutions must be typed, with your name and student number at the top of the first page. If your solutions are on multiple pages, the pages must be stapled together.

*Your written assignment must be handed in **before your recitation on Wednesday, March 28**. The online assignment will close at **11:59 p.m. on Thursday, March 29**.*

1. Solve the initial-value problems:

    (a) $y' = y^2, \quad y(0) = 1.$

    (b) $y' = y^2, \quad y(0) = 0.$

    (c) $\frac{dP}{dt} = \sqrt{Pt}, \quad P(1) = 2.$

2. A room containing 1000 m^3 of air is originally free of carbon monoxide (CO). Beginning at time $t = 0$, smoke containing 4% CO (by volume) is blown into the room at the rate of 0.1 m^3/min, and the well circulated mixture leaves the room at the same rate. Find the time when the CO concentration in the room reaches 0.012%.

3. (a) Evaluate the integral $\displaystyle\int_0^1 x^2 (1-x)^7 \, dx.$

    (b) Evaluate the integral $\displaystyle\int_0^\pi x^2 \sin(x) \, dx.$

    (c) Find the antiderivative (indefinite integral) $\displaystyle\int \cos(\theta) \cos^5(\sin(\theta)) \, d\theta.$

    (d) Find the antiderivative (indefinite integral) $\displaystyle\int \frac{1}{x^2 \sqrt{1+x^2}} \, dx.$

    (e) Find the antiderivative (indefinite integral) $\displaystyle\int \frac{3}{(x-1)^2 (x+2)} \, dx.$