

MATH 308 – MOCK MIDTERM 1

Note: Please also look at the midterm review problems for a more comprehensive study experience

1. Solve the following equation with $y(0) = 3$

$$y' = 2y \left(1 - \frac{y}{6}\right)$$

Date: Monday, February 21, 2022.

2. One solution to the differential equation below is $f(t) = \frac{1}{t}$

$$2t^2y'' + 3ty' - y = 0$$

Use Abel's formula to find another solution $g(t)$ and then find the general solution.

3. Find the longest interval on which

$$\left(\sqrt{9-t^2}\right)y'' + \ln(t-1)y' + \cos(t)y = |t-4|$$

With $y(2) = -1$ and $y'(2) = 3$ has a unique solution

4. Suppose you deposit S_0 dollars in a Bank of Peyamerica savings account that pays 10% interest per year and that you also deposit \$10 per year, both compounded continuously. Then your savings grows according to the model

$$\frac{dS}{dt} = 0.1S + 10$$

Solve for S in terms of S_0 and determine how long it takes for your initial deposit to triple.

5. Solve the following differential equation

$$x^2 y^3 + x(1 + y^2) y' = 0$$

Hint: First multiply your equation by $\frac{1}{x(y^3)}$. Leave your answer in implicit form.

6. Find the general solution to the following equations

(a) $4y'' - y = 0$

(b) $y'' + 4y' + 4y = 0$

(c) $4y'' + 8y' + 5y = 0$