

Math 507 Exam 1 – Review Problems

The exam covers Chapter 2 and sections 3.1-3.6.

In problems 1-10 find the general solution of the equation.

If an initial condition is given, find the particular solution and state the interval of validity of this solution.

1. $y' + \frac{1}{x}y = 0$, $y(-2) = 4$. Sketch the particular solution.

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

3. $y''' + 3y' - 4y = 0$, $y(0) = 0$, $y'(0) = 0$, $y''(0) = 6$

4. $y' = e^{x+y}$.

5. $e^y dx + (xe^y - 1) dy = 0$, $y(-5) = 6$.

6. $y^{(4)} - y''' = 1$

7. $y' + y - x = 0$.

8. $y \ln y dx + (x + y) dy = 0$

9. $y^{(4)} + 4y'' + 4y = 0$

10. $x^2y'' + 3xy' + 4y = 0$, $y(-1) = 2$, $y'(-1) = 1$.

In problems 11 and 12 determine whether the functions form a basis of solutions of the differential equation.

11. $y''' - y'' - 2y' = 0$, $\{1, e^{-x}, e^{2x}\}$

12. $y''' + 4y' = 0$, $\{\sin 2x, \cos 2x\}$

13. Find the largest x -interval where solution of the initial value problem exists and is unique.

$$y^{(5)} + \frac{1}{x}y^{(4)} + \frac{1}{x-10}y' + x^2y = 0$$

$$y(1) = 2, y'(1) = 3, y''(1) = -4, y'''(1) = 0, y^{(4)}(1) = -1.$$