

amsppt

1. Solve the initial value problem: $ty' + 2y = t^3$, $y(2) = 1$.

Answer: _____

2. Find α so that the following equation is exact and then solve the equation for that value of α :

$$(3x^2 - \alpha xy + 2) dx + (6y^2 - x^2 + 3) dy = 0.$$

Answer: _____

3. Solve the initial value problem: $2y'' + y' - 3y = 0$, $y(0) = 1$, $y'(0) = 0$.

Answer: _____

4. Find the general solution of: $y'' - y' = e^{2t}$.

Answer: _____

5a. Find all singular points of the differential equation:

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

and classify them as regular or irregular.

Answer: _____

5b. Let $f = e^x \cos x$ and $g = e^{-x} \sin x$. Compute the Wronkian $W(f, g)$.

Answer: _____

- 6a.** Circle the differential equation whose direction field is shown on the picture below.
A. $y' = t + 2y$, B. $y' = -t + 2y$, C. $y' = -t - 2y$, D. $y' = 2t - y$, E. $y' = 2t + y$

Answer: _____

- 6b.** Find the constant (equilibrium) solutions of the differential equation

$$dydt = y^2 (4 - y^2) .$$

Classify each one as asymptotically stable, unstable or semistable.

Answer: _____

7. Find a particular solution of: $y'' + 2y' - 3y = e^t + 65 \cos 2t$.

Answer: _____

8. Let:

$$A = \begin{pmatrix} 1 & -4 & -1 & -12 \end{pmatrix}$$

a) Find the reduced echelon form of A .

b) Find the rank of A .

Answer: _____

9. Let:

$$A = \begin{pmatrix} 1 & -4 & 0 & 2 & 0 \end{pmatrix}$$

a) Find the solution space W of the homogeneous system: $Ax = 0$.

Answer: _____

b) Find the general solution of the inhomogeneous system: $Ax = b$.

Answer: _____

10. Solve the differential equation:

$$y'' - xy' - 2y = 0$$

by means of a power series solution about the point $x_0 = 0$ as follows.

a) Find the recurrence relation for the coefficients.

Answer: _____

b) Find the first 5 terms (that is, up to power x^4) in each of two linearly independent solutions.

Answer: _____