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Subject: Calculus

Chapter: Unit 4

Category: Practice Questions

1. Determine the order of the differential equation.

a) $y' + y = 3y^2$

b) $y''' + y'' y' = 3x^2$

2. Solve the ordinary differential equation (ODE) $\frac{dx}{dt} = 5x - 3$ for $x(t)$

3. Solve the ODE with initial condition:

$$\frac{dy}{dx} = 7y^2 x^3 \quad y(2) = 3$$

4. Which of the following equations is a second-order, linear ODE:

(a) $\frac{dy}{dt} = y + 1$

(b) $\frac{d^2y}{dt^2} + y \frac{dy}{dt} + y = 1$

(c) $\frac{d^2y}{dt^2} + t^3 y = 0$

(d) $\frac{d^3y}{dt^3} + y \frac{dy}{dt} = 1$

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5. Find the Taylor Series for $f(x) = e^{-6x}$ about $x = -4$

6. Find the Taylor Series for $f(x) = \frac{7}{x^4}$ about $x = -3$

7. Find the Taylor Series for $f(x) = 7x^2 - 6x + 1$ about $x = 2$

8. Find the Maclaurin series for e^{kx} , where k is a real number.

9. Find the Maclaurin series for $(1 + x)^\mu$.

10. The necessary condition for the Maclaurin expansion to be true for function $f(x)$ is

- A. $F(x)$ should be continuous
- B. $F(x)$ should be differentiable
- C. $F(x)$ should exist at every point
- D. $F(x)$ should be continuous and differentiable

11. Solve the following differential equation.

$$Dv / dx + (1 + y^2) / y = 0$$

12. Solve the following differential equation.

$$Dy/dx = (1 + y^2) / y^3$$

13. Solve the differential equation

$$\frac{dy}{dx} + \frac{y}{x} = x^2$$

14. Find the expansion for the function, $f(x) = x^3$ centered at $a = 2$ using the Taylor Series Formula.

15. Find the expansion for the function, $f(x) = 4x$ centered at $a = 1$ using the Taylor Series Formula.