

Exam

Name _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Find the solution of the initial value problem: $\frac{dy}{dx} = 3(x + 2)^3$, $y(0) = 0$. 1) _____

A) $9(x + 2)^2 - 36$

B) $\frac{3}{2}(x + 2)^4 + 12$

C) $-\frac{3}{4}(x + 2)^4 + 12$

D) $\frac{4}{3}(x + 2)^3 - \frac{32}{3}$

E) $\frac{3}{4}(x + 2)^4 - 12$

2) Determine the solution of the differential equation $\frac{dy}{dx} = (1 - 2x)y^2$ that satisfies the condition 2) _____

$y(0) = -\frac{1}{6}$.

A) $y = \frac{1}{x^2 + x + \frac{1}{6}}$

B) $y = \frac{1}{x^2 - x + 6}$

C) $y = \frac{1}{x^2 - x - 6}$

D) $y = \frac{1}{x^2 + x - \frac{1}{6}}$

E) $y = \frac{1}{x^2 - x + 6}$

3) Find the general solution of the differential equation $\frac{dx}{dt} + 3tx = 2t$. 3) _____

A) $x = 2 + Ce^{-\frac{3}{2}t^2}$

B) $x = -\frac{2}{3} + Ce^{-\frac{3}{2}t^2}$

C) $x = \frac{2}{3} + Ce^{-\frac{3}{2}t^2}$

D) $x = -1 + Ce^{-\frac{3}{2}t^2}$

E) $x = \frac{1}{3} + Ce^{-\frac{3}{2}t^2}$

4) Solve the initial value problem $\frac{dy}{dx} = -\frac{yx}{x^2 + 1}$, $y(0) = 1$. 4) _____

A) $y(x) = \frac{4}{(x^2 + 1)^2}$

B) $y(x) = \frac{1}{(x^2 - 1)^{1/2}}$

C) $y(x) = \frac{1}{(x^2 + 1)^{1/2}}$

D) $y(x) = \frac{12}{(x^2 + 1)^{1/2}}$

E) $y(x) = \frac{3}{(x^2 + 1)^{3/2}}$

5) Solve the initial value problem $\frac{dx}{dt} - 2t(2x - 1) = 0$, $x(0) = 0$. 5) _____

A) $x = 1 - e^{2t^2}$

B) $x = \frac{1}{2} - \frac{1}{2}e^{2t^2}$

C) $x = -1 + e^{2t^2}$

D) $x = \frac{1}{2} + e^{2t^2}$

E) $x = -\frac{1}{2} + \frac{1}{2}e^{2t^2}$

6) Find the general solution of the differential equation $y' = -9x^2y^2$. 6) _____

A) $-\frac{1}{3x^2 + C}$

B) $-\frac{1}{2x^3 - C}$

C) $\frac{1}{2x^2 + C}$

D) $-\frac{1}{3x^3 - C}$

E) $\frac{1}{3x^3 + C}$

7) Solve the differential equation $y' = -2x e^y$.

7) _____

- A) $\ln\left(\frac{3}{2}x^2 + C\right)$
- B) $-\ln\left(\frac{3}{2}x^2 + C\right)$
- C) $\ln\left(\frac{1}{2}x^2 + C\right)$
- D) $\ln\left(-\frac{3}{2}x^2 + C\right)$
- E) $\ln\left(\frac{3}{2}x + C\right)$

8) Find all solutions to $\frac{dy}{dt} = 1 + \frac{1}{y^2}$.

8) _____

- A) $y - \tan^{-1}(y) = 2t + C$
- B) $y + \sin^{-1}(y) = 2t + C$
- C) $y - \tan^{-1}(y) = t + C$
- D) $y + \tan^{-1}(y) = t + C$
- E) $y + \tan^{-1}(y) = 2t + C$

9) Find an integrating factor for the differential equation $\frac{dy}{dx} + y = x$.

9) _____

- A) $\mu(x) = e^{2x}$
- B) $\mu(x) = e^{-2x}$
- C) $\mu(x) = x$
- D) $\mu(x) = e^x$
- E) $\mu(x) = e^{-x}$

10) Determine a multiplier (integrating factor) of the first order linear differential equation

10) _____

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

- A) $\mu(x) = -\frac{2}{x}$
- B) $\mu(x) = -\frac{2}{e^x}$
- C) $\mu(x) = e^{-2/x}$
- D) $\mu(x) = \frac{1}{e^{2x}}$
- E) $\mu(x) = e^{2/x}$

11) Find a general solution of the first order linear differential equation $\frac{dy}{dx} - 2y = e^{4x}$. 11) _____

A) $y = \frac{1}{2}e^{4x} + Ce^{2x}$

B) $y = e^{4x} + Ce^{2x}$

C) $y = \frac{1}{2}e^{4x} - Ce^x$

D) $y = -\frac{1}{2}e^{4x} - Ce^{2x}$

E) $y = -\frac{1}{2}e^{4x} + Ce^x$

12) Find a general solution to the first order linear differential equation $xy'(x) - 3y(x) = x^4$. 12) _____

A) $y(x) = x^4 + x^3 + C$

B) $y(x) = x^3 + Cx^2$

C) $y(x) = x^4 + \frac{C}{x^3}$

D) $y(x) = x^4 + Cx^2$

E) $y(x) = x^4 + Cx^3$

13) Find a general solution to the first order linear differential equation $\frac{dy}{dx} - 2y - \frac{1}{1 + e^{-2x}} = 0$. 13) _____

A) $y = -\frac{1}{2}e^{2x} \ln(1 - e^{-2x}) + Ce^{2x}$

B) $y = -\frac{1}{2}e^{2x} \ln(1 + e^{-2x}) + Ce^{2x}$

C) $y = -\frac{1}{2}e^{-2x} \ln(1 + e^{2x}) + Ce^{-2x}$

D) $y = \frac{1}{2}e^{2x} \ln(1 + e^{-2x}) + Ce^{2x}$

E) $y = \frac{1}{2}e^{2x} \ln(1 - e^{-2x}) + Ce^{2x}$

14) Solve the initial value problem $t^2 \frac{dx}{dt} - tx = t^6$, $x(2) = 4$. 14) _____

A) $x = \frac{t(t^4 - 254)}{4}$

B) $x = \frac{t(t^4 + 254)}{4}$

C) $x = \frac{(t^4 - 8)}{4}$

D) $x = \frac{t(t^3 + 8)}{4}$

E) $x = \frac{t(t^4 - 8)}{4}$