

## CHAPTER 9

### DIFFERENTIAL EQUATIONS

#### ASSERTION & REASONING QUESTIONS

Q. NO.	Question
1	<p>Assertion: Order of the differential equation <math>\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^{1/3} + x^{1/4} = 0</math></p> <p>Reason: The order of a differential equation is the order of highest derivative occurring in the differential equation.</p> <p>(a) Both assertion and reason are true and reason is the correct explanation of assertion. (b) Both are true but reason is not the correct explanation of assertion. (c) Assertion is true reason is false. (d) Assertion is false, reason is true.</p>
2	<p>Assertion: The degree of the differential equation <math>\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^{1/3} + x^{1/4} = 0</math> is 3.</p> <p>Reason: The order of the differential equation is equal to the number of arbitrary constant present in the solution of that differential equation.</p> <p>(a) Both assertion and reason are true and reason is the correct explanation of assertion. (b) Both are true but reason is not the correct explanation of assertion. (c) Assertion is true reason is false. (d) Assertion is false, reason is true.</p>
3.	<p>Assertion: Differential equation <math>\frac{dy}{dx} = \frac{xy}{xy} + \frac{y}{x}</math> is homogeneous equation.</p> <p>Reason: A function <math>(x,y)</math> is called homogeneous of degree <math>n</math> if <math>f(kx,ky) = k^n f(x,y)</math>.</p> <p>(a) Both assertion and reason are true and reason is the correct explanation of assertion. (b) Both are true but reason is not the correct explanation of assertion. (c) Assertion is true reason is false. (d) Assertion is false, reason is true.</p>

4.	<p>Assertion: <math>(dy/dx) - y \tan x = \sec x</math> is a linear differential equation. Reason: it is of the type <math>(dy/dx) + Py = Q</math> where P&amp;Q are the function of x only which is the standard form of linear differential equation.</p> <p>(a) Both assertion and reason are true and reason is the correct explanation of assertion. (b) Both are true but reason is not the correct explanation of assertion. (c) Assertion is true reason is false. (d) Assertion is false, reason is true.</p>
5.	<p>Assertion: Integrating factor of <math>(dy/dx) - y \tan x = -y^2 \sec x</math> is <math>\cos x</math> Reason: Integrating factor I.F. = for linear differential equation <math>(dy/dx) + Py = Q</math>.</p> <p>(a) Both assertion and reason are true and reason is the correct explanation of assertion. (b) Both are true but reason is not the correct explanation of assertion. (c) Assertion is true reason is false. (d) Assertion is false, reason is true.</p>

Q.No.	Questions
6	<p>Assertion: The order of differential equation <math>\frac{d^2 y}{dx^2} + y = 0</math> is 2. Reason: The highest order derivative is 2.</p> <p>(A) Both Assertion and Reason is true and Reason is correct explanation of the Assertion (B) Both Assertion and Reason is true But Reason is not correct explanation of the Assertion (C) Assertion is true ,Reason is false (D) Assertion is false, Reason is true</p>
7	<p>Assertion: The degree of differential equation <math>\frac{d^3 y}{dx^3} + 2\left(\frac{d^2 y}{dx^2}\right)^2 + \frac{dy}{dx} + y = 0</math> is 1. Reason : The highest exponent is 2.</p> <p>(A) Both Assertion and Reason is true and Reason is correct explanation of the Assertion (B) Both Assertion and Reason is true But Reason is not correct explanation of the Assertion (C) Assertion is true ,Reason is false (D) Assertion is false,Reason is true</p>
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	<p>Assertion: The number of arbitrary constants in the general solution of a differential equation of third order is 3.</p> <p>Reason : To solve the Differential equation of third order we have to integrate thrice.</p> <p>(A) Both Assertion and Reason is true and Reason is correct explanation of the Assertion</p> <p>(B) Both Assertion and Reason is true But Reason is not correct explanation of the Assertion</p> <p>(C) Assertion is true ,Reason is false</p> <p>(D) Assertion is false,Reason is true</p>
9	<p>Assertion : The number of arbitrary constants in the Particular solution of a differential equation of third order is 3</p> <p>Reason : To solve the Differential equation of third order we have to integrate thrice</p> <p>(A) Both Assertion and Reason is true and Reason is correct explanation of the Assertion</p> <p>(B) Both Assertion and Reason is true But Reason is not correct explanation of the Assertion</p> <p>(C) Assertion is true ,Reason is false</p> <p>(D) Assertion is false, Reason is true</p>
10	<p>Assertion: A homogeneous differential equation of the form <math>\frac{dy}{dx} = h\left(\frac{x}{y}\right)</math> can be solved by making the substitution <math>y=vx</math></p> <p>Reason: By making the substitution <math>y=vx</math> it will change into variable seperable form.</p> <p>(A) Both Assertion and Reason is true and Reason is correct explanation of the Assertion</p> <p>(B) Both Assertion and Reason is true But Reason is not correct explanation of the Assertion</p> <p>(C) Assertion is true ,Reason is false</p> <p>(D) Assertion is false,Reason is true</p>

Q. No.	Question
11	<p>Assertion: <math>y = a \sin x + b \cos x</math> is a general solution of <math>y'' + y = 0</math></p> <p>Reason: <math>y = a \sin x + b \cos x</math> is a trigonometric function.</p> <p>(A) Both Assertion and reason are true and reason is correct explanation of assertion.</p> <p>(B) Assertion and reason both are true but reason is not the correct explanation of assertion.</p> <p>(C) Assertion is true, reason is false.</p> <p>(D) Assertion is false, reason is true.</p>
12	Assertion: The degree of the differential equation

	<p><math>y'' + y' = \ln(y'')</math> is <math>2^{\circ}</math>.</p> <p>Reason: the degree of the differential equation which can be written as polynomial in the derivatives is the degree of the derivative of the highest order occurring in it.</p> <p>(A) Both Assertion and reason are true and reason is correct explanation of assertion.  (B) Assertion and reason both are true but reason is not the correct explanation of assertion.  (C) Assertion is true, reason is false.  (D) Assertion is false, reason is true</p>
13	<p>Assertion: The solution of the differential equation <math>\frac{dy}{dx} = 1 + x + y + xy</math> is <math>\log(1 + y) = \frac{x^2}{2} + x + c</math></p> <p>Reason: The above equation can be solved by using variable separable method.</p> <p>(A) Both Assertion and reason are true and reason is correct explanation of assertion.  (B) Assertion and reason both are true but reason is not the correct explanation of assertion.  (C) Assertion is true, reason is false.  (D) Assertion is false, reason is true</p>
14	<p>The differential equation of all circles in a plane must of order 3.</p> <p>Assertion:  Reason: if three points are non - collinear, then only one circle always passing through these points.</p> <p>(A) Both Assertion and reason are true and reason is correct explanation of assertion.  (B) Assertion and reason both are true but reason is not the correct explanation of assertion.  (C) Assertion is true, reason is false.  (D) Assertion is false, reason is true</p>
15	<p>Assertion: <math>\sin x \frac{d^2y}{dx^2} + \cos x \frac{dy}{dx} + \tan x = 0</math> is not a linear differential equation because</p> <p>Reason: A differential equation is said to be linear if dependent variable and its differential coefficients occurs in first degree and are not multiplied together.</p> <p>(A) Both Assertion and reason are true and reason is correct explanation of assertion.  (B) Assertion and reason both are true but reason is not the correct explanation of assertion.  (C) Assertion is true, reason is false.</p>

	(D) Assertion is false, reason is true
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Q. No.	Question
16	<p>Assertion: The differential equation <math>(x - y)\frac{dy}{dx} = x + 2y</math> is homogenous differential equation.</p> <p>Reason: A differential equation of the form <math>\frac{dy}{dx} = F(x, y)</math> is said to be homogenous if <math>F(x, y)</math> is a homogenous function of degree zero.</p> <p>(A) Both Assertion and reason are true and reason is correct explanation of assertion.            (B) Assertion and reason both are true but reason is not the correct explanation of assertion.            (C) Assertion is true, reason is false.            (D) Assertion is false, reason is true.</p>
17	<p>Assertion: The order of the differential equation <math>\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = 0</math> is 1.</p> <p>Reason: Order of a differential equation is defined as the order of the highest order derivative of the dependent variable with respect to the independent variable involved in the given differential equation.</p> <p>(A) Both Assertion and reason are true and reason is correct explanation of assertion.            (B) Assertion and reason both are true but reason is not the correct explanation of assertion.            (C) Assertion is true, reason is false.            (D) Assertion is false, reason is true.</p>
18	<p>Assertion: The differential equation <math>\frac{dx}{dy} + x = \cos y</math> is first order linear differential equation.</p> <p>Reason: Order and degree (if defined) of a differential equation are always positive integers.</p> <p>(A) Both Assertion and reason are true and reason is correct explanation of assertion.            (B) Assertion and reason both are true but reason is not the correct explanation of assertion.            (C) Assertion is true, reason is false.            (D) Assertion is false, reason is true.</p>
19	<p>Assertion: The function <math>y = e^{-3x}</math> is a solution of the differential equation <math>\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = 0</math></p>

	<p>Reason: The solution which contains arbitrary constants is called the particular solution (primitive) of the differential equation.</p> <p>(A) Both Assertion and reason are true and reason is correct explanation of assertion.</p> <p>(B) Assertion and reason both are true but reason is not the correct explanation of assertion.</p> <p>(C) Assertion is true, reason is false.</p> <p>(D) Assertion is false, reason is true.</p>
20	<p>Assertion: The degree of the differential equation <math>y'''' + \sin y''' = 0</math> is not defined.</p> <p>Reason: Degree of a given differential equations is not defined if the given differential equation is not a polynomial equation in its derivatives.</p> <p>(A) Both Assertion and reason are true and reason is correct explanation of assertion.</p> <p>(B) Assertion and reason both are true but reason is not the correct explanation of assertion.</p> <p>(C) Assertion is true, reason is false.</p> <p>(D) Assertion is false, reason is true.</p>

Q. No.	Question
21	<p>Assertion: The differential equation <math>y^3 dy + (x + y^2) dx = 0</math> becomes homogeneous if we put <math>y^2 = t</math></p> <p>Reason: All differential equation of first order and first degree becomes homogeneous if we put <math>y^2 = t</math>.</p> <p>(A) Both Assertion and reason are true and reason is correct explanation of assertion.</p> <p>(B) Assertion and reason both are true but reason is not the correct explanation of assertion.</p> <p>(C) Assertion is true, reason is false.</p> <p>(D) Assertion is false, reason is true.</p>
22	<p>Assertion A ray of light from origin after reflection at the point <math>P(x, y)</math> of any curve becomes parallel to x-axis, the equation of curve may be <math>y^2 = 2x + 1</math>.</p> <p>Reason: A ray of light parallel to axis after reflection from parabolic mirror always passes through the focus.</p> <p>(A) Both Assertion and reason are true and reason is correct explanation of assertion.</p> <p>(B) Assertion and reason both are true but reason is not the correct explanation of assertion.</p>

	(C) Assertion is true, reason is false. (D) Assertion is false, reason is true
23	<p>Consider the differential equation <math>(xy - 1)\frac{dy}{dx} + y^2 = 0</math></p> <p>Assertion: The solution of the equation is <math>xy = \log y + c</math>.</p> <p>Reason: The given differential equation can be expressed as <math>\frac{dx}{dy} + P_x = Q</math>, whose integrating factor is <math>\log y</math>.</p> <p>(A) Both Assertion and reason are true and reason is correct explanation of assertion. (B) Assertion and reason both are true but reason is not the correct explanation of assertion. (C) Assertion is true, reason is false. (D) Assertion is false, reason is true</p>

**ANSWERS**

Q. NO.	Answer
1	(a)
2	(b)
3	(d)
4	(a)
5	(a)
6	A
7	C
8	A
9	D
10	A
11	B
12	B

13	A
14	A
15	D
16	A
17	D
18	B
19	C
20	A
21	C
22	B
23	C

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