Choose the correct Answer.

Application of Derivatives:

1. Equation of tangent at point (x_1, y_1) & having slope m is given by,
   A) $y - y_1 = x - x_1$ B) $x - x_1 = y - y_1$ C) $y - y_1 = m(x - x_1)$ D) $x - x_1 = m(y - y_1)$
2. Maximum & minimum values of the function $y = x^3 - 9x^2 + 24x$ is...
   A) (20, 16) B) (-20, 16) C) (16, 20) D) (-16, -20)
3. Find two parts of 80 if 80 is divided into two parts such that their product is maximum.
   A) (30, 50) B) (20, 60) C) (40, 40) D) (60, 20)
4. Maximum value of $y = x^3 - 18x^2 + 96x$ is...
   A) 160 B) 128 C) -128 D) 163
5. Radius of curvature of any curve y = f(x) at any point $P(x_1, y_1)$ is,
   A) $\rho = \frac{\left[1+\frac{dy}{dx}\right]^{\frac{3}{2}}}{\frac{d^2y}{dx^2}}$ B) $\rho = \frac{\left[1-\frac{dy}{dx}\right]^{\frac{3}{2}}}{\frac{d^2y}{dx^2}}$ C) $\rho = \frac{\left[1-\left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}}{\frac{d^2y}{dx^2}}$ D) $\rho = \frac{\left[1+\left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}}{\frac{d^2y}{dx^2}}$
6. Radius of curvature to the curve $x^2 + y^2 = 25$ at $(4, 3)$ is
   A) 3 B) 5 C) 25 D) $\sqrt{5}$

Integration

1. $\int [\log_a a + e^{2\log x} + e^{x\log a}]dx$ is...
   A) $x - \frac{x^3}{3} + \frac{a^x}{\log x} + C$ B) $x + \frac{x^3}{2} + \frac{a^x}{\log a} + C$ C) $x - \frac{x^3}{3} + \frac{a^x}{\log a} + C$ D) $x + \frac{x^3}{3} + \frac{a^x}{\log a} + C$
2. $\int \frac{\cos(\log x)}{x} dx$ is...
   A) $\sin(\log x) + C$ B) $\cos(\log x) + C$ C) $\log(\sin x) + C$ D) $\log(\cos x) + C$
3. $\int \frac{1+\tan x}{1-\tan x} dx$ is
   A) $\log(\cos x - \sin x) + C$ B) $-\log(\cos x - \sin x) + C$
   C) $\log(\cos x + \sin x) + C$ D) $-\log(\cos x + \sin x) + C$
4. Third or middle term of the integral $\int \frac{1}{x^2+3x+2} dx$ is...
   A) $\frac{4}{9}$ B) $\frac{9}{4}$ C) $\frac{3}{2}$ D) 3
5. If u & v any two different functions of x, then integration by parts rule is...
   A) $\int u.v\,dx = u\int v\,dx + \int\left[\int v\,dx.\frac{d}{dx}(u)dx\right]$ B) $\int u.v\,dx = v\int u\,dx + \int\left[\int u\,dx.\frac{d}{dx}(v)dx\right]$
   C) $\int u.v\,dx = v\int u\,dx - \int\left[\int u\,dx.\frac{d}{dx}(v)dx\right]$ D) $\int u.v\,dx = u\int v\,dx - \int\left[\int v\,dx.\frac{d}{dx}(u)dx\right]$
6. $\int x.e^x\,dx$ is...
   A) $xe^x + e^x + C$ B) $xe^x - e^x + C$ C) $e^x - xe^x + C$ D) $e^x + xe^x + C$
7. $\int e^{e^x} e^x dx =$
   A) $e^x + C$ B) $e^{e^x} + C$ C) $e^x - 1 + C$ D) $e^x + 1 + C$
8. $\int \frac{1}{x^2-a^2} dx =$
   A) $\frac{1}{2a}\log\left[\frac{x+a}{x-a}\right] + C$ B) $\frac{1}{2a}\log\left[\frac{a+x}{a-x}\right] + C$
   C) $\frac{1}{2a}\log\left[\frac{a-x}{a+x}\right] + C$ D) $\frac{1}{2a}\log\left[\frac{x-a}{x+a}\right] + C$

Definite Integration

1. $\int_1^3 x^2\,dx$ is...

   A) $\frac{26}{9}$ B) $\frac{3}{26}$ C) $\frac{26}{3}$ D) $\frac{9}{26}$

2. $\int_0^2 \frac{1}{2x+1}\,dx$ is...

   A) $\frac{1}{2}\log 4$ B) $\frac{1}{2}\log 3$ C) $\frac{1}{2}\log 5$ D) $2\log 5$

3. $\int_a^b f(x)\,dx =$

   A) $\int_a^b f(a-b+x)\,dx$ B) $\int_a^b f(a+b-x)\,dx$ C) $\int_a^b f(a-b-x)\,dx$ D) $\int_a^b f(a+b+x)\,dx$

4. $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}}\,dx$ is...

   actually pi by 4

   A) 0 B) $\frac{\pi}{2}$ C) $\frac{\pi}{12}$ D) $\frac{\pi}{6}$

5. $\int_2^7 \frac{\sqrt{x}}{\sqrt{x}+\sqrt{9-x}}\,dx$ is...

   A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{2}{5}$ D) $\frac{2}{7}$

6. $\int_0^1 \frac{1}{\sqrt{1-x^2}}\,dx$ is ...

   A) 0 B) $\frac{\pi}{2}$ C) $\frac{\pi}{12}$ D) $\frac{\pi}{6}$

Application of Definite Integration

1. The area between the two curves $y_1 = f(x)$ & $y_2 = g(x)$ for $x = a$ to $x = b$ is given by

   A) $\int_a^b [y_1 - y_2]\,dx$ B) $\int_a^b y\,dx$ C) $\int_a^b y_1 - y_2 dx$ D) $\int_a^b y_2 - y_1 dx$

2. The area of circle $x^2 + y^2 = 16$ is...

   A) 4π sq. units B) 16π sq. units C) 16 sq. units D) 4 sq. units

3. The area between the parabola $y = x^2 + 3$ and the line $y = x + 3$ is...

   A) $\frac{1}{3}$ sq. units B) $\frac{1}{6}$ sq. units C) $\frac{1}{32}$ sq. units D) $\frac{1}{16}$ sq. units

4. The area bounded by the parabolas $y^2 = 9x$ and $x^2 = 9y$ is...

   A) 3 sq. units B) 4 sq. units C) 9 sq. units D) 27 sq. units

Differential Equations

1. The order & degree of differential equation $\left(\frac{d^3y}{dx^3}\right)^3 + 2\left(\frac{d^2y}{dx^2}\right)^4 + 5\frac{dy}{dx} + 6y = 4$ is...

   A) order $= 2$, degree $= 4$ B) order $= 3$, degree $= 3$ C) order $= 4$, degree $= 2$ D) order $= 2$, degree $= 3$

2. The necessary & sufficient condition for the differential equation $Mdx + Ndy = 0$ to be exact is...

   A) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$ B) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$ C) $\frac{\partial x}{\partial M} = \frac{\partial y}{\partial N}$ D) $\frac{\partial y}{\partial M} = \frac{\partial x}{\partial N}$

3. If $(3x^2 + 6xy^2)dx + (6x^2y + 4y^3)dy = 0$ is exact differential equation then $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x} = ?$

   A) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x} = 6x$ B) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x} = 12xy$ C) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x} = 12y$ D) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x} = 12x$

4. Integrating factor of Linear Differential Equation $\frac{dy}{dx} + \frac{y}{x} = x^3$ is...

   A) $\log x$ B) $\frac{1}{x}$ C) $e^{\frac{1}{x}}$ D) x

5. Integrating factor of linear Differential Equation $\frac{dy}{dx} + 3y = e^{-x}\cos x$ is...

A) $3x$ B) e^{3x} C) e^{-3x} D) e^{x^3}

Probability

1. If in a random experiment 'n' exhaustive, mutually exclusive & equally likely outcomes of which 'm' are favourable to an event 'A', then probability of A is denoted by P(A) is given by ...

A) $P(A) = \frac{n(A)}{n(S)}$

B) $P(A) = \frac{n(S)}{n(A)}$

A) Only A B) Only B C) Both A & B D) None of them

2. Find the probability that a card drawn from a pack of cads is a diamond.

A) $\frac{1}{52}$ B) $\frac{1}{13}$ C) $\frac{1}{4}$ D) $\frac{12}{52}$

3. A die is tossed in the air once. Probability that getting odd number is....

A) 6 B) $\frac{1}{2}$ C) 3 D) $\frac{1}{3}$

Probability Distribution

1. Binomial distribution to find probability of 'r' successes is given by ...

A) $P(r) = n_{C_r}\, q^r p^{n-r}$ B) $P(r) = n_{C_r}\, p^r q^{n-r}$ C) $P(r) = n_{C_r}\, q^{n-r} p^n$ D) $P(r) = n_{C_r}\, q^n p^{n-r}$

2. An unbiased coin is tossed 6 times. Probability of getting 2 heads is ...

A) $\frac{15}{32}$ B) $\frac{15}{13}$ C) $\frac{64}{12}$ D) $\frac{15}{64}$

3. If 30% of the bulbs produced are defective, find the probability that out of 4 bulbs selected one defective is ...

A) 0.9613 B) 0.4116 C) 0.3245 D) 0.5214

4. The probability of 'r' successes by Poisson distribution is given by ...

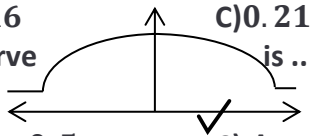
A) $P(r) = \frac{e^{-r}m^r}{r!}$ B) $P(r) = \frac{e^{-r}r^m}{r!}$ C) $P(r) = \frac{e^{-m}m^r}{r!}$ D) $P(r) = \frac{e^{-m}m^r}{m!}$

5. In a sample of 100 bulbs, if 5% of the electric bulbs manufactured by a company are defective. Using Poisson distribution find the mean.

A) $Mean = 2$ B) $Mean = 3$ C) $Mean = 5$ D) $Mean = 4$

6. If 2% of the electric bulbs manufactured by a company are defective, find the probability that in a sample of 100 bulbs, 3 bulbs will be defective.

A) 0.1804 B) 0.4116 C) 0.2134 D) 0.5213

7. Area under the standard normal curve  is ..

A) $Area = 2$ B) $Area = 0.5$ C) $Area = 1$ D) $Area = -0.5$

8. In a sample of 1000 students the mean of certain test is 14 & S.D. is 2.5 assuming the distribution to be normal. Find how many score above 18. (Given area between $z = 0$ to $z = 1.6$ is 0.4452)

A) 0.0548 B) 55 C) 53 D) 52