



# MATHS

## BOOKS - MODERN PUBLICATION

### SAMPLE PAPER 2012

#### Exercise

1. Differentiate  $a^{\ln x}$  with respect to  $x$ .



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2. Mention the values of  $x$  for which the function  $f(x) = x^3 - 12x$  is increasing.



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3. Evaluate  $\lim_{x \rightarrow 0} \frac{3X - 2\ln(1 + X)}{X}$ .



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4. What is  $F'(t)$  if  $F(t) = \int_a^t e^{3x} \cdot \cos 2x dx$ ?





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5. integrate  $\int \frac{3 + \cos x + \tan^2 x}{2x + \sin x + \tan x}$



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6. Write the particular solution of the equation  $\frac{dy}{dx} = \sin x$  given that  $y(\pi) = 2$ .



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7. Write the order and degree of the following

differential equation 
$$d^2 \frac{y}{dx^2} = 2y^3 + \frac{\left(\frac{dy}{dx}\right)^4}{\sqrt{\frac{d^2y}{dx^2}}}$$



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8. What is the point of intersection of the line

$x = y = z$  with the plane  $x + 2y + 3z = 6$ ?



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9. To which coordinate axis is the plane  $2x + 3z = 0$  parallel ?



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10. Find the component of the vector  $\vec{b} = 8\hat{i} + \hat{j}$  in the direction of the vector  $\vec{a} = \hat{i} + 2\hat{j} - 2\hat{k}$ .



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11. What is the minimum value of  $n$  if  $P(n, 2) > 131$  ?



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12. What is the probability of getting a total of utmost 11 when two dice are thrown ?



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**13.** Determine the maximum value of

$$\begin{vmatrix} \cos x \sin x \\ -\sin x \cos x - 1 \end{vmatrix}.$$



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**14.** Write the solution of the following LPP

$$\text{Maximise } Z = x + y$$

$$\text{Subject to } 3x + 4y \leq 12, x \geq 0, y \geq 0$$



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15. Prove that , if  $y = \log \tan \left( \frac{\pi}{4} + \frac{x}{2} \right)$  , then

$$\frac{dy}{dx} = \sec x$$



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16. Differentiate with respect to  $x$  :

$$Y = 2^{x^2} + \tan^{-1} \left( \frac{\cos x - \sin x}{\cos x + \sin x} \right)$$



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17. Find  $\frac{\partial}{\partial y} \left( \frac{\partial z}{\partial x} \right)$  if  $z = x^y + y^x$





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**18. Evaluate**  $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\log\left(x - \frac{\pi}{2}\right)}{\tan x}$



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**19. Find the equation of tangent to the curve**  
 $x = y^2 - 2$  at the points where slope of the  
normal equal to (-2).



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20. Integrate  $\int_{-3/5}^{3/5} [2x + 1] dx$



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21. Find the area of the region bounded by the curve  $y = 6x - x^2$ , the X-axis and the two ordinates  $x = 0$  and  $x = 9$ .



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



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23. Solve  $(x \log x) \frac{dy}{dx} + y = 2 \log x$ .



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24. Find a vector  $\vec{b}$  such that  $\vec{a} \times \vec{b} = \vec{c}$

and  $\vec{a} \cdot \vec{b} = 3$ , where

$$\vec{a} = \hat{i} + \hat{j} + \hat{k}, \vec{c} = \hat{j} - \hat{k}.$$



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**25.** Prove by vector method that in a  $\triangle ABC$ ,  $c^2 = a^2 + b^2 - 2ab \cos C$ .



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**26.** Find the co-ordinates of the point where the perpendicular from the origin meets the line joining the points  $(-9, 4, 5)$  and  $(11, 0, -1)$ .



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27. Solve for  $x$ ,

$$\begin{vmatrix} 15 - 2x & 11 & 10 \\ 11 - 3x & 17 & 16 \\ 7 - x & 14 & 13 \end{vmatrix} = 0$$



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28. If  $A = \begin{bmatrix} -1 & 3 & 5 \\ 1 & -3 & -5 \\ -1 & 3 & 5 \end{bmatrix}$ , then find  $A^3 - A^2$ .



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**29.** Find the value of the term free from  $X$  in the expansion of  $\left(\frac{3}{2}(x^2) - \frac{1}{3x}\right)^9$



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**30.**  $A$  and  $B$  are two events. If  $P(A) = \frac{3}{8}$ ,  $P(B) = \frac{1}{2}$  and  $P(A \cap B) = \frac{1}{4}$ , then find  $P(A^c \cap B^c)$  and  $P(A \cap B^c)$



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**31.** If A and B are independent events, show that

$A^c$  and  $B^c$  are independent,



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**32.** Find  $\frac{dy}{dx}$

$$y = \cot^{-1}(\ln \cos e c^{-1} x)$$



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**33.** Evaluate the following integrals

$$\int \frac{12 \sin x - 2 \cos x + 3}{\sin x + \cos x} dx$$



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**34.**  $\int_0^{\pi} \frac{x dx}{1 + \sin x}$



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**35.**  $\int \frac{1 + x^2}{x \sqrt{x^4 + 1}} dx$



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**36.** Prove that the four points  $(0, 4, 3)$ ,  $(-1, -5, -3)$ ,  $(-2, -2, 1)$  and  $(1, 1, -1)$  lie in one plane. Find the equation of the plane.



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**37.** Solve by matrix inversion method.

$$x + y + z = 2$$

$$2x + y + z = 4$$

$$x + y - z = 1$$



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