



# MATHS

## BOOKS - UNITED BOOK HOUSE

### SET 12

#### Exercise

1. The value of  $\sin^{-1} \cos 150^\circ$  is.....

A.  $\frac{\pi}{3}$

B.  $-\frac{\pi}{3}$

C.  $\frac{2\pi}{3}$

D.  $\frac{-2\pi}{3}$

**Answer:**



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2. If a square matrix  $A$  is equal to its transpose

$A^T$ , then  $A^T$  is called a

A. symmetric

B. identify

C. skew symmetric

D. none of these.

**Answer:**



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**3.** The points of discontinuities of the function

$$f(x) = \frac{x + 2}{2x^2 - x - 1} \text{ are:}$$

A.  $\frac{1}{2}, -1$

B.  $-\frac{1}{2}, -1$

C.  $1, -\frac{1}{2}$

D.  $\frac{1}{2}, 1$

**Answer:**



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4. The value of  $\int e^{-\frac{1}{x}} \frac{.1}{x^2} dx$  is.....

A.  $\frac{1}{x} e^{-\frac{1}{x}} + c$

B.  $-\frac{1}{x} e^{-\frac{1}{x}} + c$

C.  $e^{-\frac{1}{x}} + c$

D.  $-e^{-\frac{1}{x}} + c.$

**Answer:**



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5. The value of  $p$  for which the vectors  $p\hat{i} - 5\hat{j}$  and  $2\hat{i} - 3\hat{j}$  are collinear is

A.  $\frac{5}{3}$

B.  $\frac{10}{3}$

C. 10

D. 1

**Answer:**



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6. The angle between the lines whose direction ratios are proportional to 1, -2, 1 and 4, 3, 2 is.....

A.  $\frac{3\pi}{4}$

B.  $\frac{\pi}{2}$

C.  $\frac{\pi}{3}$

D.  $\frac{\pi}{4}$

**Answer:**



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7. An unbiased coin is tossed three times in succession, then the probability of getting exactly one head is

A.  $\frac{1}{2}$

B.  $\frac{5}{8}$

C.  $\frac{3}{4}$

D.  $\frac{3}{8}$

**Answer:**



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**8.** The probability density function of a random variable  $X$  is  $f(x) = k(x - 1)^2$ ,  $1 \leq x \leq 2$ . The value of the constant  $K$  is

A. 3

B. 4



C. 5

D. 6

**Answer:**



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9. Solve:  $\sin^{-1} \cos(\sin^{-1} x) = \frac{\pi}{3}$ .



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10. If  $A = \begin{bmatrix} 4 & 5 \\ 5 & 6 \end{bmatrix}$ , show that  $A^2 = 10A + I$

where  $I$  is the unit matrix of order 2.



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11. Prove that,  $\lim_{x \rightarrow 0} \frac{\log \cos x}{\sin^2 x} = -\frac{1}{2}$



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12. If  $y = \tan^{-1}(\sec x + \tan x)$ , find  $\frac{d^2y}{dx^2}$ .



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13. Prove that, 
$$\int_a^b f(a + b - x) dx = \int_a^b f(x) dx$$



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14. Solve:  $2^{x-y} dx + 2^{y-x} dy = 0$



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15. If  $x > \frac{1}{2}$ , show that the function  $f(x) = x(4x^2 - 3)$  is steadily increasing.



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16. Find the area in the fourth quadrant bounded by the curve  $y = x^3 - 8$  and the coordinate axes.



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17. Can the numbers 1,2,3 be the direction ratio of a straight line? Give reason.



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**18.** Find the intercept form of a plane with intercepts 2,3 and 4 on the x,y and z-axis respectively.



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**19.** A and B are two independent events with  $P(A) = \frac{2}{5}$  and  $P(B) = \frac{1}{3}$ , evaluate  $P(A \cup B)$ .



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**20.** The mean and variance of a binomial distribution are 4 and 3 respectively. Find the values of its parameters.



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**21.** If  $\tan^{-1} x$ ,  $\tan^{-1} y$  and  $\tan^{-1} z$  are in A.P, find the algebraic relation between  $x, y$  and  $z$ . If  $x, y, z$  be also in A.P. then show that  $x = y = z (y \neq 0)$ .



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22. Prove that, the inverse of a given square matrix, if it exists, is unique.



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23. Prove that,

$$\begin{vmatrix} 2a & a - b - c & 2a \\ 2b & 2b & b - c - a \\ c - a - b & 2c & 2c \end{vmatrix} = (a + b + c)^3$$



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24. If  $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$ , show that,

$$\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}$$



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25. Evaluate:

$$\int \frac{x dx}{(x^2 - a^2)(b^2 - x^2)} \quad (b^2 > a^2).$$



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26. Evaluate:

$$\int \frac{\sqrt{x} dx}{\sqrt{a^3 - x^3}}$$



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27. Solve:  $\frac{dy}{dx} - \frac{y}{x} + \operatorname{cosec}\left(\frac{y}{x}\right) = 0$ , given  $y = 0$

when  $x = 1$



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28. Solve:  $y^2 + \left(x - \frac{1}{y}\right) \frac{dy}{dx} = 0$ .



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**29.** The position vectors of the points A and B are  $2\vec{a} + \vec{b}$  and  $\vec{a} - 3\vec{b}$ . If the point C divides the line segment  $\overline{AB}$  externally in the ratio 1:2, then find the position vector of the point C. Show also that A is the midpoint of the line segment  $\overline{CB}$ .



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30. Evaluate:  $\int_0^{\pi} |\sin x + \cos x| dx$



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31. evaluate  $\int_0^1 e^{-x} dx$



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32. A packet, of 10 electronic components is known to include 3 defectives. If 4 componenets

are randomly chosen and tested, what is the probability of finding not more than one defective in the packet?



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**33.** A random variable  $x$  follows binomial distribution with mean 3 and standard deviation  $\sqrt{2}$ . Find the value of  $P(x = 2)$  and  $P(x \leq 1)$ .



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34. (b) answer any two questions : (i) a circular ink blot grows at the rate of  $2c \frac{m^2}{\text{sec}}$ . find the rate at which the radius is increasing after  $2\left(\frac{6}{11}\right)$  seconds



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35. answer any two questions :(iii) if the straight line  $lx+my=n$  be a normal to the hyperbola  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ , then by the application of calculus prove that  $\frac{a^2}{l^2} - \frac{b^2}{m^2} = \frac{(a^2 + b^2)^2}{n^2}$ .



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**36.** Find the vector equation of a line which passes through the point with position vector  $\hat{i} - 2\hat{j} + 4\hat{k}$  and is in the direction of  $\hat{i} + 2\hat{j} - \hat{k}$ . Also reduce it to cartesian form.



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**37.** Let  $\vec{n}$  be a vector of magnitude  $2\sqrt{3}$  such that it makes equal acute angles with the coordinate axes. Find the vector and cartesian

forms of the equation of a plane passing through  $(1,-1,2)$  and normal to  $\vec{n}$ .



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