MATHS

BOOKS - UNITED BOOK HOUSE

SET 15

Exercise

1. Find the value of $\tan^{-1}\left\{2\cos\left(2\frac{\sin^{-1}1}{2}\right)\right\}$. (Consider principal values only).

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2. If $f(x) = x^2 - 5x + 10$ and A = $\begin{bmatrix} 1 & -2 \\ 3 & 4 \end{bmatrix}$, find f(A).

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3. Solve for x:

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

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4. Differentiate $\frac{\tan^{-1}\left(\sqrt{1+x^2}-1\right)}{x}$ w,r,t. $\tan^{-1}x$

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5. Find if Lagrange's Mean Value Theorem is applicable to the function

f(x) = $x + \frac{1}{x}$ in [1,3]

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6. Evaluate:

$$\int \cos(\log x)\, dx.$$

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7. Show that a right triangle of given hypotenuse has maximum area, when it is an isosceles triangle.

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8. Find the interval in which f(x) = sinx + cos x.

$[x \in [0, 2\pi]]$ increases.

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9. Evaluate:

$$\int_0^1 \left(\frac{1}{1+x}\right) dx.$$

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10. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are such that $\vec{a} \times \vec{b} = \vec{c}$ and $\vec{b} \times \vec{c} = \vec{a}$, prove that $\vec{a}$, $\vec{b}$ and $\vec{c}$ are mutually perpendicular $\left|\vec{b}\right|$ =1 and $\left|\vec{c}\right| = \left|\vec{a}\right|$.

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11. Find the angle between the lines $\vec{r} = \left(2\hat{i} - \hat{j} + 3\hat{k}\right) + \lambda\left(\hat{i} + \hat{j} + 2\hat{k}\right)$ and $\vec{r} = \left(\hat{i} - 3\hat{j}\right) + \mu\left(2\hat{j} - \hat{k}\right)$

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12. If P(A) = 2P(B) = $\frac{2}{5}$ and $P\left(\frac{B}{A}\right) = \frac{1}{3}$, find $P\left(\frac{A}{B}\right)$ and $P(A \cup B)$.

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13. A pair of dice is thrown 3 times. Find the probability of getting a doublet exactly two times.

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14. If

$$\tan^{-1}\left[\frac{yz}{xr}\right]+\tan^{-1}\left[\frac{zx}{yr}\right]+\tan^{-1}\left[\frac{xy}{zr}\right]=\frac{\pi}{2}$$

prove that, $x^2+y^2+z^2=r^2$.

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15. If $A=\begin{bmatrix}1 & -1\\ 2 & -1\end{bmatrix}, B=\begin{bmatrix}a & 1\\ b & -1\end{bmatrix}$ and $(A+B)^2=A^2+B^2$ find a and b.

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16. Prove that, $\begin{bmatrix} 1+x & 1 & 1 \\ 1 & 1+y & 1 \\ 1 & 1 & 1+z \end{bmatrix} = xyz\left(1+\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$

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17. Solve : $\begin{bmatrix} x-2 & 2x-3 & 3x-4 \\ x-4 & 2x-9 & 3x-16 \\ x-8 & 2x-27 & 3x-64 \end{bmatrix} = 0$

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18. If $\sin y = x \sin(a + y)$ then show that $\frac{dy}{dx} = \frac{\sin a}{1 - 2x \cos a + x^2}$.

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19. Evaluate: $\int e^{4x} \sin 3x dx$

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20. Evaluate: $\int \frac{\tan \theta d\theta}{1 - \sin \theta}$

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21. Solve:(x+y+1)dx + (2x+2y-1)dy = 0

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22. solve: $\frac{dy}{dx} + \frac{\sin 2y}{x} = x^3 \cos^2 y.$

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23. If the vectors $a\hat{i} + \hat{j} + \hat{k}$, $\hat{i} + b\hat{j} + \hat{k}$ and $\hat{i} + \hat{j} + c\hat{k}$ are coplanar where $a \neq 1$, $b \neq 1$,

$c \neq 1$, prove that

$$\frac{1}{1-a}+\frac{1}{1+b}+\frac{1}{1-c}=1.$$

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24. If $\vec{a}+\vec{b}+\vec{c}=\vec{0}$ then prove that $\vec{a}\times\vec{b}=\vec{b}\times\vec{c}=\vec{c}\times\vec{a}$.

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25. Evaluate (with the help of definite integral):

$$\lim_{n\to\infty}\left\{\left(1+\frac{1}{n}\right)\left(1+\frac{2}{n}\right)\ldots\left(1+\frac{n}{n}\right)\right\}^{\frac{1}{n}}$$

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26. find the value of $\int_2^3 a^x dx (a < 0)$.

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27. Two cards are drawn successively with replacement from a well-shuffled pack of 52 cards. Find the mean and variance the number of kings.

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28. Find the maximum value of $f(x) = \left(\frac{1}{x}\right)^x$

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29. Solve: $xdx + ydy + \frac{xdy - ydx}{x^2 + y^2}$=0 given y = 1 when x= 1.

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30. Find the equation of the plane which contains the two parallel line:

$$\frac{x-4}{1}=\frac{y-3}{-4}=\frac{z-2}{5} \quad \text{and} \quad \frac{x-3}{1}=\frac{y+2}{-4}=\frac{z}{5}$$

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31. A and B are two independent events such that $P(A \cup B)$ = 0.8 and P(A) = 0.3. P(B) is.....

A. $\frac{5}{7}$

B. $\frac{2}{3}$

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

D. $\frac{1}{8}$

Answer:

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32. $\vec{a}, \vec{b}, \vec{c}$ are three mutually perpendicular unit vectors then $\left|\vec{a} + \vec{b} + \vec{c}\right|$ is equal to

A. 1

B. $\sqrt{3}$

C. 3

D. $\frac{1}{3}$

Answer:

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33. The value of x if $\tan^{-1} x + 2\cot^{-1} x = \frac{2\pi}{3}$ is

A. $\sqrt{3}$

B. $\sqrt{2}$

C. 2

D. 3

Answer:

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34. The degree of the differential equation $\frac{d^3y}{dx^3} + x\left(\frac{dy}{dx}\right)^4 = 4\left(\frac{d^4y}{dx^4}\right)$

A. 1

B. 3

C. 4

D. undefined.

Answer:

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35. If f(x) = [x] and g(x)=|x| the value of $f\left(g\left(\frac{8}{5}\right)\right)-g\left(f\left(-\frac{8}{5}\right)\right)$ is

A. 2

B. 1

C. -1

D. -2

Answer:

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36. A random variable x takes values 0,1,2,3.....wiht probability $P(X=x)=K(x+1)\left(\frac{1}{5}\right)^x$,where K is a constant,P(X=0)is

A. $\frac{7}{25}$

B. $\frac{18}{25}$

C. $\frac{13}{25}$

D. $\frac{16}{25}$

Answer:

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37. The angle between the planes $2x - y + z = 6$ and $x + y + 2z = 7$ is

A. $\frac{\pi}{6}$

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

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

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

Answer:

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38. Statement - 1 : The value of the integral

$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1+\sqrt{\tan x}}$ is equal to $\frac{\pi}{6}$

Statement-2 : $\int_a^b f(x) = \int_a^b f(a+b-x)dx$

A. 0

B. 1

C. $\frac{\pi}{6}$

D. $\frac{\pi}{12}$

Answer:

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39. If $A = \begin{bmatrix} 0 & 2 \\ 3 & -4 \end{bmatrix}, kA = \begin{bmatrix} 0 & 3a \\ 2b & 24 \end{bmatrix}$ then find the value of k+a+b.

A. $6, -12, -18$

B. $-4, 6, 9$

C. $-6, -4, -9$

D. $6, -4, 9.$

Answer:

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