MATHS

BOOKS - KCET PREVIOUS YEAR PAPERS

MODEL TEST PAPER 02

Mathematics

1. The degree of the differential equation $\frac{d^2y}{dx^2} + 3\left(\frac{dy}{dx}\right)^2 = x^2 \log\left(\frac{d^2y}{dx^2}\right)$ is

A. 1

B. 2

C. 3

D. none of these

Answer: A

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2. The general solution of $\frac{dy}{dx} = \frac{ax + h}{by + k}$ represents a parabola when

A. a = , b = 0

B. a =1 , b = 2

C. a = 0 , $b \neq 0$

D. a= 2 , b= 1

Answer: C

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3. The rate of increase of bacteria in a certain culture is proportional to the number present . If it doubles in 5 hours , then in 25 hours , its number would be

A. 8 times the original

B. 16 times the original

C. 32 times the original

D. 64 times the original

Answer: C

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4. If the vector $\vec{a} = \hat{i} + a\hat{j} + a^2\hat{k}$, $\vec{b} = \hat{i} + b\hat{j} + b^2\hat{k}$, $\vec{c} = \hat{i} + c\hat{j} + c^2\hat{k}$ are three non-coplanar vectors and $\begin{vmatrix} a & a^2 & 1+a^3 \\ b & b^2 & 1+b^3 \\ c & c^2 & 1+c^3 \end{vmatrix} = 0$, then the value of abc is equal to

A. 2

B. 1

C. 0

D. -1

Answer: D

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5. If $\left|\vec{a}\right| = \left|\vec{b}\right| = \left|\vec{a} + \vec{b}\right| = 1$, then the value of $\left|\vec{a} - \vec{b}\right|$ is equal to

A. 1

B. $\sqrt{3}$

C. $\sqrt{2}$

D. $\sqrt{3}/2$

Answer: B

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6. If $\vec{a}$, a vector of magnitude 50 , is collinear with the vector $\vec{b} = 6\hat{i} - 8\hat{j} - \frac{15}{2}\hat{k}$, and makes an acute angle with the positive direction of z-axis , then the vector $\vec{a}$ is equal to

A. $24\hat{i} - 32\hat{j} + 30\hat{k}$

B. $-24\hat{i} + 32\hat{j} + 30\hat{k}$

C. $16\hat{i} - 16\hat{j} - 15\hat{k}$

D. $-12\hat{i} + 16\hat{j} - 30\hat{k}$

Answer: B

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7. A unit vector perpendicular to the two vectors $\hat{i}+2\hat{j}-\hat{k}$ and $2\hat{i}+3\hat{j}+\hat{k}$ is equal to

A. $35\left(5\hat{i}-3\hat{j}-\hat{k}\right)$

B. $\sqrt{35}\left(5\hat{i}-3\hat{j}-\hat{k}\right)$

C. $\frac{1}{\sqrt{35}}\left(5\hat{i}-3\hat{j}-\hat{k}\right)$

D. $\frac{1}{35}\left(5\hat{i}+3\hat{j}-\hat{k}\right)$

Answer: C

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8. If $\vec{p}=\vec{a}-\vec{b}$, $\vec{q}=\vec{a}+\vec{b}$ and $\left|\vec{a}\right|=\left|\vec{b}\right|=2$, then the value of $\left|\vec{p}\times\vec{q}\right|$ is equal to

A. $2\sqrt{16-\left(\vec{a}\cdot\vec{b}\right)^2}$

B. $\sqrt{16-\left(\vec{a}\cdot\vec{b}\right)^2}$

C. $2\sqrt{4-\left(\vec{a}\cdot\vec{b}\right)^2}$

D. $\sqrt{4-\left(\vec{a}\cdot\vec{b}\right)^2}$

Answer: A

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9. Forces of magnitude 3 and 2 units acting in the directions $5\hat{i}+3\hat{j}+4\hat{k}$ and $3\hat{i}+4\hat{j}-5\hat{k}$ respectively act on a particle which is displaced from the point (1 , 1 , -1) to (3 , 3 , 1) . The work done by the forces is equal to

A. $80\sqrt{2}$ units

B. $40\sqrt{2}$ units

C. $16\sqrt{2}$ units

D. $8\sqrt{2}$ units

Answer: D

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10. If A , B , C , D are four points in a straight line such that distance from A to B is 10 , B to C is 5 , C to D is 4 and A to D is 1 , then their correct sequence is

A. $A - B - C - D$

B. $C - D - A - B$

C. $A - D - C - B$

D. $C - B - A - D$

Answer: C

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11. The modulus and principal argument of the complex number $\frac{1+2i}{1-(1-i)^2}$ are , respectively

A. $1, \pi$

B. $1, \ -\pi$

C. $1/2, \pi$

D. $1, 0.$

Answer: D

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12. If ω is a complex cube root of unity , then the value of $\omega^{99} + \omega^{100} + \omega^{101}$ is

A. 1

B. -1

C. 3

D. 0

Answer: D

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13. If $S_n = nP + \frac{n(n-1)}{2}$ Q where S_n denotes the sum of the first n terms of an A.P. , then the common difference is

A. $P + Q$

B. $2P + 3Q$

C. $2Q$

D. Q

Answer: D

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14. If $x > 1, y > 1, z > 1$ are in G.P. , then $\frac{1}{1+\log x}, \frac{1}{1+\log y}$ and $\frac{1}{1+\log z}$ are in

A. A.P.

B. H.P.

C. G.P.

D. none of these

Answer: B

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15. The roots of the equation $(q-r)x^2 + (r-p)x + (p-q) = 0$ are

A. $\frac{r-p}{q-r}, \frac{1}{2}$

B. $\frac{p-q}{q-r}, 1$

C. $\frac{q-r}{p-q}, 1$

D. $\frac{r-p}{p-q}, \frac{1}{2}$

Answer: B

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16. If the equation $(x+m)^2-(x+n)^2=(m-n)^2$ where m , n are non- zero constants and $m^2 \neq n^2$, satisfied by x = pm + pn , then the ordered pair (p , q) is equal to

A. (0 , -1)

B. (-1 , 0)

C. (1 , 0)

D. (0, 1)

Answer: A

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17. If a man and his wife enter a bus , in which five seats are vacant , then the number of different ways in which they can be seated is

A. 2

B. 5

C. 20

D. 40

Answer: C

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18. The expansion of $(1+2x)^{-1/2}$, by binomial theorem, is valid when

A. $x > 1/2$

B. $x < 1/2$

C. $-1/2 < x < 12$

D. $-2 < x < 2.$

Answer: C

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19. If

$$\left(1+x+x^2\right)^n = a_0 + a_1 x + a_2 x^2 + \ldots + a_{2n} x^{2n} \quad ,$$

then $a_0 + a_2 + a_4 + \ldots + a_{2n}$ equals

A. $\frac{3^n + 1}{2}$

B. $\frac{3^n - 1}{2}$

C. $\frac{1 - 3^n}{2}$

D. $3^n + \frac{1}{2}$

Answer: A

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20. If $\log_4 7 = x$, then $\log_7 16$ is equal to

A. $2/x$

B. x^2

C. x

D. $2x$

Answer: A

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21. The matrix $\begin{bmatrix} 2 & 6 & 1 \\ 1 & 9 & 3 \end{bmatrix}$ is of order

A. 3×2

B. 2×3

C. 6×9

D. 2×1

Answer: B

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22. If A = $\begin{bmatrix} 1 & 2 \\ 5 & 6 \end{bmatrix}$, B = $\begin{bmatrix} 3 & 5 \\ x & -4 \end{bmatrix}$ and $A + B = \begin{bmatrix} 4 & 7 \\ 6 & 2 \end{bmatrix}$, then the value of x must be

A. 6

B. 1

C. 0

D. -1.

Answer: B

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23. If α, β are the roots of the equation $1 + x + x^2 = 0$, then the matrix product $\begin{bmatrix} 1 & \beta \\ \alpha & \alpha \end{bmatrix} \begin{bmatrix} \alpha & \beta \\ 1 & \beta \end{bmatrix}$ is equal to

A. $\begin{bmatrix} 1 & 1 \\ 1 & 2 \end{bmatrix}$

B. $\begin{bmatrix} -1 & -1 \\ -1 & 2 \end{bmatrix}$

C. $\begin{bmatrix} 1 & -1 \\ -1 & 2 \end{bmatrix}$

D. $\begin{bmatrix} -1 & -1 \\ -1 & -2 \end{bmatrix}$

Answer: B

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24. If the determinant $\begin{vmatrix} x & 1 & 3 \\ 0 & 0 & 1 \\ 1 & x & 4 \end{vmatrix} = 0$, then x is equal to

A. 2 or -2

B. 3 or -3

C. 1 or -1

D. 3 or 4

Answer: C

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25. The value of the determinant

$$\begin{vmatrix} 1 & x & x+z \\ 1 & y & z+x \\ 1 & z & x+y \end{vmatrix}$$ is

A. x

B. y

C. z

D. 0

Answer: D

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26. If the matrix B be the adjoint of the square matrix A , I be the identify matrix of the same order as A , and $k(\neq 0)$ be the value of the determinant of A , then AB is equal to

A. I

B. KI

C. $k^2 I$

D. $(1/k)I.$

Answer: B

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27. If the system of equation : $x + y + z = 0, 2x + 3y + 4z = 0, kx + y - z = 0$ has a non - zero solution , then the value of k is

A. -1

B. 1

C. 3

D. 5

Answer: C

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28. The value of $\sin 10^\circ + \sin 20^\circ + \sin 30^\circ + \ldots + \sin 360^\circ$ is equal to

A. 0

B. $1/2$

C. 1

D. 2

Answer: A

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29. If $A + B + C = 3\pi/2$, then the value of cos 2 A + cos 2 B + cos2 C is equal to

A. $1 - 4\cos A \cdot \cos B \cdot \cos C$

B. $4\sin A \cdot \sin B \cdot \sin C$

C. $1 + 2\cos A \cdot \cos B \cdot \cos C$

D. $1 - 4\sin A \cdot \sin B \cdot \sin C$

Answer: D

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30. If $\frac{\sin(x+y)}{\sin(x-y)} = \frac{a+b}{a-b}$, then the value of $\frac{\tan x}{\tan y}$ is

A. a/b

B. b/a

C. ab

D. (a- b) / (a+ b)

Answer: A

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31. The value of $\frac{\sin^2 3A}{\sin^2 A} - \frac{\cos^2 3A}{\cos^2 A}$ is equal to

A. cos 2 A

B. 8 cos 2 A

C. $\frac{1}{8\cos 2A}$

D. $\frac{\cos 2A}{8}$

Answer: B

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32. If $\sin^{-1}\left(\frac{2a}{1+a^2}\right)+\sin^{-1}\left(\frac{2b}{1+b^2}\right)=2\tan^{-1}x$, then x is equal to

A. $\frac{a-b}{1+ab}$

B. $\frac{b}{1+ab}$

C. $\frac{b}{1-ab}$

D. $\frac{a+b}{1-ab}$

Answer: D

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33. If in a ΔABC a + c = 2b , then the value of $\cot\frac{A}{2}\cdot\cot\frac{B}{2}$ is equal to

A. 4.5

B. 3

C. 1.5

D. 1

Answer: B

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34. A flag- staff 6 metre high is placed on the top of a tower . The flag-staff casts a shadow , which is $2\sqrt{3}$ metre long wen measured along the ground . The angle , in degrees , that the sun-rays make with the ground is

A. 60°

B. 45°

C. 30°

D. 15°

Answer: A

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35. The equation ax + by + c =0 represents a straight line

A. for all real numbers a , b , c

B. only when $a \neq 0$

C. only when $b \neq 0$

D. only when at least one of a and b is non-zero

Answer: D

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36. The equation of the line passing through $(-1, -2)$ and having a slope of 4/7 is

A. $7y + 10 = 4x$

B. $y = \frac{4}{7}x + \frac{10}{7}$

C. $x = \frac{4}{7}y + \frac{10}{7}$

D. $4x + 7y = 10.$

Answer: A

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37. The angle between the lines $x\cos\alpha + y\sin\alpha = a$ and $x\sin\beta - y\cos\alpha = a$ is

A. $\beta - \alpha$

B. $\pi + \beta - \alpha$

C. $\frac{\pi}{2} + \alpha + \beta$

D. $\frac{\pi}{2} - \beta + \alpha.$

Answer: D

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38. The co-ordinates of the centre and the radius of the circle $x^2 + y^2 + 4x - 6y - 36 = 0$, are , respectively given by

A. $(-4, 6)$ and 6

B. $(4, -6)$ and 7

C. (2 , -3) and 6

D. (-2 , 3) and 7

Answer: D

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39. The equation $x^2 + y^2 + 2gx + 2fy + c = 0$ represents a circle of non-zero radius if

A. $g^2 + f^2 > c$

B. $g^2 + f^2 < c$

C. $g^2 > f^2 + c$

D. $g^2 < f^2 + c$

Answer: A

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40. The length of the latus rectum of the ellipse $25x^2 + 4y^2 = 100$, is

A. 25/2

B. 16/5

C. $8/5$

D. $5/8$

Answer: C

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41. The standard equation of the hyperbola having the distance between foci as 32 and eccentricity $2\sqrt{2}$ is

A. $7x^2 - y^2 = 56$

B. $x^2 - 7y^2 = 56$

C. $7x^2 - y^2 = 224$

D. $x^2 - 7y^2 = 224$

Answer: C

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42. Find the eccentricity of the elipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$

A. $7/16$

B. $9/16$

C. $\sqrt{7}/3$

D. $\sqrt{7}/4$

Answer: D

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43. If the angle between the lines whose direction ratios are 2 , -1 , 2 and x , 3 , 5 is $\pi/4$, then the smallest value of x is

A. 52

B. 4

C. 2

D. 1

Answer: C

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44. The point of intersection of the lines $\frac{x+1}{3}=\frac{y+3}{5}=\frac{z+5}{7}$ and $\frac{x-2}{1}=\frac{y-4}{3}=\frac{z-6}{5}$ is

A. (1/2 , 1/2 , -3/2)

B. (-1/2 , -1/2 , 3/2)

C. (1/2 , -1/2 , -3/2)

D. (-1/2 , 1/2 , 3/2)

Answer: C

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45. The point of intersection of the line joining the points (-3 , 4 , -8) and (5 , -6 , 4) with XY- plane is

A. (7/3 , -8/3 , 0)

B. (-7/3 , -8/3 , 0)

C. (-7/3 , 8/3 , 0)

D. (7/3 , 8/3 , 0)

Answer: A

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46. If a real valued function of a real variable is defined as f (x) = $\cos^{-1}(3x-1)$, then the domain of the function f , is given by

A. $\left\{x : 0 \leq x \leq \frac{1}{3}\right\}$

B. $\{x : 1 \leq x \leq 2\}$

C. $\left\{x : 0 \leq x \leq \frac{2}{3}\right\}$

D. $\left\{x : 0 \leq x \leq \frac{3}{2}\right\}$

Answer: C

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47. If X = { 1 , 2 , 3} and Y = {0 , 1} and f : $X \to Y$ defined by f = { (1 , 1) , (2 , 1) , (3, 0) } , then f is

A. one -to-one but onto

B. onto but not one-to-one

C. one-to-one and onto

D. neither one-to-one nor into.

Answer: B

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48. $\lim_{x \to \infty} \left(\frac{x+6}{x+1} \right)^{x+4}$, is equal to

A. 5

B. e

C. e^5

D. $1/e^5$

Answer: C

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49. If the function .

$f(x) = 4 \times 5^x$ for x < 0

= 8a + x for $x \geq 0$, is continuous , then the value of a is

A. $1/2$

B. 2

C. 3

D. 4

Answer: A

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50. If $f(a) = 2, f'(a) = 1, g(a) = -1, g'(a) = 2$, then $\lim_{x \to a} \frac{g(x) \cdot f(a) - g(a) \cdot f(x)}{x - a}$ is equal to

A. -5

B. 0

C. $1/5$

D. 5

Answer: D

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51. The derivative of $\tan^{-1}\left[\frac{\sqrt{1+x^2}-1}{x}\right]$ with respect to $\tan^{-1}$ x is

A. $1/4$

B. $1/3$

C. $1/2$

D. 1

Answer: C

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52. The value of dy/dx , when cos x = $\frac{1}{\sqrt{1+t^2}}$ and sin y = $\frac{t}{\sqrt{1+t^2}}$ is

A. -2

B. -1

C. 1

D. 2

Answer: C

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53. If y = a cos 2 x + b sin 2 x , then

A. $\frac{d^2y}{dx^2} + y = 0$

B. $\frac{d^2y}{dx^2} + 2y = 0$

C. $\frac{d^2y}{dx^2} + 3y = 0$

D. $\frac{d^2y}{dx^2} + 4y = 0$

Answer: D

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54. If $l_1 = \frac{d}{dx}\left(e^{\sin x}\right), l_2 = \lim_{h \to 0} \frac{e^{\sin(x+h)} - e^{\sin x}}{h}$ and $l_3 = \int e^{\sin x} \cdot \cos x dx$, then

A. $l_1 \neq l_2$

B. $\frac{d}{dx}(l_3) = l_2$

C. $\int l_3 dx = l_2$

D. $l_2 = l_3$.

Answer: B

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55. The value of the integral $\int e^{\tan^{-1}x} \cdot \frac{(1+x+x^2)}{(1+x^2)}$ dx is equal to

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

B. $x^2 e^{\tan -1x} + c$

C. $(1+x)e^{\tan^{-1}x} + c$

D. $xe^{\tan^{-1}x} + c$

Answer: D

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56. The value of the integral $\int \frac{dx}{x(1+\log x)^2}$ is equal to

A. $\frac{-1}{1+x}$

B. $\frac{-1}{1+\log x}$

C. $\frac{1}{1+\log x}$

D. $\frac{1}{1+x^2}$

Answer: B

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57. If the binary operation $*$ is defined on a set of ordered pairs of real numbers as $(a, b) * (c, d) = (ad + bc, bd)$ and is associative , then $(1, 2) * (3, 5) * (3, 4)$ =

A. (74 , 40)

B. (32 , 40)

C. (23 , 11)

D. (7 , 11)

Answer: A

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58. The set of matrices $S = \left\{ \begin{bmatrix} x & -x \\ -x & x \end{bmatrix} 0 \neq x \in R \right\}$ forms a group under multiplication operation with identify element

A. $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$

C. $\begin{bmatrix} -1 & 1 \\ 1 & -1 \end{bmatrix}$

D. $\begin{bmatrix} 1/2 & -1/2 \\ -1/2 & 1/2 \end{bmatrix}$

Answer: D

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59. Let p and q denote the following propositions : p : To become an army officer you should be a graduate q : To become an army officer you should have good health . Then the compound proposition "To become an army officer you should be a graduate and you should have good health " is represented as

A. $p \vee q$

B. $p \rightarrow q$

C. $p \wedge q$

D. $p \Leftrightarrow q$

Answer: C

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60. Indicate which of the following is a tautology .

A. $(\sim p \vee q) \sim (p \vee \sim q)$

B. $(\sim p \vee \sim q) \rightarrow p \vee q$

C. $(p \vee \sim q) \wedge (p \vee q)$

D. $(\sim p \vee \sim q) \vee (p \vee q)$

Answer: D

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