Question Review

All

$\sin^{-1}\left(\cos\left(\sin^{-1} x\right)\right) + \cos^{-1}\left(\sin\left(\cos^{-1} x\right)\right)$ is equal to:

Not Attempted

- 0
- $\frac{\pi}{4}$
- $\frac{3\pi}{4}$
- $\frac{\pi}{2}$

EXPLANATIONS Report

77 % were correct!

Check with $x = 0$

If $M = \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$ and $M^2 - \lambda M - I_2 = 0$ then $\lambda =$

Not Attempted

- -2
- 2
- -4
- 4

EXPLANATIONS Report

62 % were correct!

$M^2 - \lambda M - I_2 = 0$

$$\Rightarrow \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}\begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix} - \begin{bmatrix} \lambda & 2\lambda \\ 2\lambda & 3\lambda \end{bmatrix} - \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = O$$

$$\Rightarrow \begin{bmatrix} 5 & 8 \\ 8 & 13 \end{bmatrix} - \begin{bmatrix} \lambda & 2\lambda \\ 2\lambda & 3\lambda \end{bmatrix} - \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = O$$

$$\Rightarrow \begin{bmatrix} 5-\lambda & 8-2\lambda \\ 8-2\lambda & 13-3\lambda \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$\Rightarrow 5-\lambda = 1, 8-2\lambda = 0, 13-3\lambda = 1$

$\Rightarrow \lambda = 4$ which satisfies all the three equations.

If z is a complex number such that $z^2 = (\overline{z})^2$ then

Not Attempted

- z is purely real
- z is purely imaginary
- either z is purely real or purely imaginary
- none of these

EXPLANATIONS

Report

43 % were correct!

Let $z = x + iy$, then its conjugate $\overline{z} = x - iy$

Given that $z^2 = (\overline{z})^2$

$\Rightarrow x^2 - y^2 + 2ixy = x^2 - y^2 - 2ixy \Rightarrow 4ixy = 0$

So, $x = 0$ or $y = 0$.

H.M. between the roots of the equation $x^2 - 10x + 11 = 0$ is :

Not Attempted

- $\frac{1}{5}$
- $\frac{5}{21}$
- $\frac{21}{20}$
- $\frac{11}{5}$

EXPLANATIONS

Report

72 % were correct!

Let roots be $\alpha,\ \beta$ then

$$HM = \frac{2\alpha\beta}{\alpha+\beta} = \frac{11\times 2}{10} = \frac{11}{5}.$$

$C_1 + 2C_2 + 3C_3 + 4C_4 + \ldots + nC_n =$

Not Attempted

- 2^n
- $n.2^n$
- $n.2^{n-1}$
- $n.2^{n+1}$

EXPLANATIONS Report

66 % were correct!

Put $n = 1, C_1 = 1$

Option (a) gives 2, (b) gives 2, (c) gives 1, (d) gives 4.

So, (c) seems correct.

For verification put $n = 2$.

$C_1 + 2C_2 = 2 + 2 = 4$

Option (c) gives 4.

The solution of $\sin^2 x - \cos x = 1/4$ in the internal $0 \leq x \leq \pi$ is

Not Attempted

- $\frac{\pi}{4}$
- $\frac{\pi}{6}$
- $\frac{\pi}{3}$
- $\frac{\pi}{2}$

If $\vec{a}, \vec{b}, \vec{c}$ are any three vectors such that $\left(\vec{a} + \vec{b}\right) . \vec{c} = \left(\vec{a} - \vec{b}\right) . \vec{c}$=0, then $\left(\vec{a} \times \vec{b}\right) \times \vec{c}$ is

Not Attempted

- $\vec{0}$
- $\vec{a}$

- $-\vec{b}$
- $\vec{b}$

The derivative of $(3x+5)^4$ w.r.t $(3x+5)$ is:

Not Attempted

- $5(3x+5)^3$
- $3x^2 + 5x + 4$
- $4(3x+5)^3$
- $12(3x+5)^3$

$\int \sqrt{x^2-4}\,dx$ = [IOE - 068]

Not Attempted

- $\frac{x\sqrt{x^2-4}}{2} - 2\log(x+\sqrt{x^2-4}) + c$
- $\frac{x\sqrt{x^2-4}}{2} - 2\cos^{-1}\frac{x}{2} + c$
- $\frac{2}{3}(x^2-4)^{3/2} + c$
- $\frac{x\sqrt{x^2-4}}{2} - 2\sin^{-1}\frac{x}{2} + c$

$\frac{d}{dx}\{\cos(\sin x^2)\} =$

Not Attempted

- $\sin(\sin x^2)\cdot\cos x^2.2x$
- $-\sin(\sin x^2)\cdot\cos x^2.2x$
- $-\sin(\sin x^2)\cdot\cos^2 x.2x$

○ none of these

EXPLANATIONS Report

77 % were correct!

Using Chian rule;

$$\frac{d}{dx}\{\cos(\sin x^2)\} = -\sin(\sin x^2)\cos x^2 .2x$$

$$\lim_{x\to 0}\frac{-\sin|x|}{x}$$

Not Attempted

○ does not exist

● equals to -1

○ equals to 1

○ equals to 0

The equation x^2-4xy+$4y^2$-3x-6y-4=0 represents a

Not Attempted

○ circle

● parabola

○ ellipse

○ pair of straight lines

The locus of the point which is equidistant from the x-axis and y-axis is:

Not Attempted

○ y = 2x

○ 3x - y = 0

● x - y = 0

○ x + 4y = 0

The equation of the line perpendicular to the line $2x + y = 5$ at a distance 3 units from the origin is:

Not Attempted

- $2x + y + 5 = 0$
- $x - 2y \pm 2\sqrt{5} = 0$
- $x - 2y + 3\sqrt{5} = 0$ ✓
- $x - 2y \pm \sqrt{5} = 0$

The acute angle between the lines $x - y = 0$ and $y = 0$ is:

Not Attempted

- 60^0
- 30^0
- 75^0
- 45^0 ✓

A force of 250 N acts on a body, the momentum acquired by the body is 125 kg m/s. The time for which force act on body is

Not Attempted

- 0.5 sec ✓
- 0.2 sec
- 125 × 250 sec
- 2 sec

EXPLANATIONS Report

66 % were correct!

$F \times t$ = change in momentum

$\therefore \quad t = \frac{125}{250} = 0.5$ sec.

The terminal velocity of a drop of water is 2cm/s. If 27 such droplets coalesce then the terminal velocity of single drop will be

Not Attempted

- 2cm/s
- 6cm/s
- 12cm/s
- 18cm/s

EXPLANATIONS Report

59 % were correct!

$\frac{v_2}{v_1} = (n)^{2/3}$

or, $v_2 = (27)^{2/3} \times 2 = 18\text{cm/s}$

Dimensional formula of velocity gradient $\frac{dv}{dx}$ is

Not Attempted

- $[M^\circ L^\circ T^{-1}]$
- $[MLT^{-1}]$
- $[ML^\circ T^{-1}]$
- $[M^\circ LT^{-2}]$

A machine gun fires 10 g bullets at the rate of 10 bullets/sec with a speed of 500 m/s. The force required to hold the gun is

Not Attempted

- 5000 N
- 500 N
- 50 N
- 150 N

EXPLANATIONS Report

65 % were correct!

$$F = \frac{Nmv}{t} = 10 \times 10 \times 10^{-3} \times 500 = 50 \text{ N}$$

The gas of rms speed 1.9×10^3 m/s contain 6.8×10^{21} molecules/m^3 then pressure of gas of molar mass 2g is

Not Attempted

- 0.1mm of Hg
- 0.2mm of Hg
- 0.3mm of Hg
- 0.4 mm of Hg

EXPLANATIONS

Report

49 % were correct!

$$\mathrm{P} = \frac{1}{3}\mathrm{nm}\overline{C^2}$$

$$= \frac{1}{3} \times 6.8 \times 10^{21} \times \frac{2 \times 10^{-3}}{6.023 \times 10^{23}} \times (1900)^2$$

$$= 27\mathrm{N/m^2}$$

$$\mathrm{P} = \rho \mathrm{gh}$$

$$\mathrm{h} = \frac{P}{\rho g} = \frac{27}{13600 \times 10} = 0.2\text{mm of Hg}$$