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India's Number 1 Education App

MATHS

BOOKS - DISHA PUBLICATION MATHS (HINGLISH)

COMPLEX NUMBERS AND QUADRATIC EQUATIONS

Jee Main 5 Years At A Glance

1. If $\alpha, \beta \in C$ are the distinct roots of the equation $x^2 - x + 1 = 0$, then $\alpha^{101} + \beta^{107}$ is equal to

A. 0

B. 1

C. 2

D. -1

Answer: B

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2. The least positive integer n for which $\left(\frac{1+i\sqrt{3}}{1-i\sqrt{3}}\right)^n = 1,$ is

A. 2

B. 6

C. 5

D. 3

Answer: D

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3. Let p, q and r be real numbers $(p \neq q, r \neq 0)$, such that the roots of the equation $\frac{1}{x+p} + \frac{1}{x+q} = \frac{1}{r}$ are equal in magnitude but opposite in sign, then the sum of squares of these roots is equal to.

A. $p^2 + q^2 + r^2$

B. $p^2 + q^2$

C. $2(p^2 + q^2)$

D. $\frac{p^2 + q^2}{2}$

Answer: B

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4. If an angle A of a $\triangle ABC$ satisfies $5\cos A + 3 = 0$, then the roots of the quadratic equation, $9x^2 + 27x + 20 = 0$ are

A. sin A, sec A

B. sec A, tan A

C. tan A, cos A

D. sec A, cot A

Answer: B

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5. If, for a positive integer n, the quadratic equation, $x(x+1)+(x+1)(x+2)+\ldots\ldots+(x+\overline{n-1})(x+n)=10n$ has two consecutive integral solutions, then n is equal to

A. 11

B. 12

C. 9

D. 10

Answer: A

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6. Let $p(x)$ be a quadratic polynomial suchthat $p(0) = 1$. If $p(x)$ leaves remainder 4 when divided by $x - 1$ and it leaves remainder 6 when divided by $x + 1$; then

A. p(2)=11

B. p(2)=19

C. p(-2)=19

D. p(-2)=11

Answer: C

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7. A value of θ for which $\frac{2+3i\sin\theta}{1-2i\sin\theta}$ is purely imaginary, is

A. $\sin^{-1}\left(\frac{\sqrt{3}}{4}\right)$

B. $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$

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

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

Answer: B

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8. The sum of all real values of x satisfying the equation $\left(x^2-5x+5\right)^{x}$ ^ $(2+4x-60)=1$ is: (1) 3 (2) -4 (3) 6 (4) 5

A. 6

B. 5

C. 3

D. -4

Answer: C

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9. The point represented by $2+i$ in the Argand plane moves 1 unit eastwards, then 2-units northwards and finally from there $2\sqrt{2}$ units in the south-westwards direction. Then its new position in the Argand plane is at the point represented by

A. 1+i

B. 2+2i

C. $-2+2i$

D. $-1-i$

Answer: A

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10. If the equations $x^2+bx-1=0$ and $x^2+x+b=0$ have a common root different from -1 then $|b|$ is equal to

A. 2

B. 3

C. $\sqrt{3}$

D. $\sqrt{2}$

Answer: C

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11. A complex number z is said to be uni-modular if $|z| = 1$. Suppose z_1 and z_2 are complex numbers such that $\frac{z_1 - 2z_2}{2 - z_1 z_2}$ is uni-modular and z_2 is not uni-modular. Then the point z_1 lies on a:

A. circle of radius 2.

B. circle of radius $\sqrt{2}$.

C. straight line parallel to x-axis

D. straight line parallel to y-axis.

Answer: A

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12. Let α and β be the roots of the equation $x^2 - 6x - 2 = 0$ If $a_n = \alpha^n - \beta^n$ for $n \geq 0$ then find the value of $\frac{a_{10} - 2a_8}{2a_9}$

A. 3

B. -3

C. 6

D. -6

Answer: A

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13. If $2+3i$ is one of the roots of the equation $2x^3-9x^2+kx-13=0, k\varepsilon R,$ then the real root of this equation

A. exists and is equal to $-\frac{1}{2}$

B. exists and is equal to $\frac{1}{2}$

C. exists and is equal to 1

D. does not exist

Answer: B

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14. If z is a complex number such that $|z| \geq 2$ then the minimum value of $\left|z + \frac{1}{2}\right|$ is

A. is strictly greater than $\frac{5}{2}$

B. is strictly greater than $\frac{3}{2}$ but less than $\frac{5}{2}$

C. is equal to $\frac{5}{2}$

D. lie in the interval (1, 2)

Answer: D

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15. If $a \in R$ and the equation $-3(x-[x])^2+2(x-[x])+a^2=0$ (where [x] denotes the greatest integer $\leq x$) has no integral solution, then all possible values of a lie in the interval: (1) (-2,-1) (2) $(\infty, -2) \cup (2, \infty)$ (3) $(-1, 0) \cup (0, 1)$ (4) (1,2)

A. (-2,-1)

B. $(-\infty, -2) \cup (2, \infty)$

C. $(-1, 0) \cup (0, 1)$

D. $(1, 2)$

Answer: C

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16. Let $w(Imw \neq 0)$ be a complex number. Then the set of all complex numbers z satisfying the equal $w - \overline{w}z = k(1 - z)$, for some real number k, is :

A. $\{z : |z| = 1\}$

B. $\{z : z = \bar{z}\}$

C. $\{z : z \neq 1\}$

D. $\{z : |z| = 1, z \neq 1\}$

Answer: D

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17. If $\frac{1}{\sqrt{\alpha}}$ and $\frac{1}{\sqrt{\beta}}$ are the roots of equation $ax^2 + bx + 1 = 0($ $a \neq 0, (a, b \in R))$, then the equation $x\left(x + b^3\right) + \left(a^3 - 3abx\right) = 0$ has roots -

A. $\alpha^{\frac{3}{2}}$ and $\beta^{\frac{3}{2}}$

B. $\alpha\beta^{\frac{1}{2}}$ and $\alpha^{\frac{1}{2\beta}}$

C. $\sqrt{\alpha\beta}$ and $\alpha\beta$

D. $\alpha^{-\frac{3}{2}}$ and $\beta^{-\frac{3}{2}}$

Answer: A

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18. If the quadratic equations $ax^2 + bx + c = 0(a, b, c\varepsilon R, a \neq 0)$ and $x^2 + 4x + 5 = 0$ have a common root, then a,b,c must satisfy the relations

A. $1:2:3$

B. $2:3:4$

C. $4:3:2$

D. $3:2:1$

Answer: B

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Exercise 1 Concept Builder Topic 1

1. If $z = 2 + i$, then $(z-1)(\bar{z}-5) + (\bar{z}+1)(z-5)$ is equal to

A. 2

B. 7

C. -1

D. -4

Answer: D

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2. If z_1 and z_2, are two non-zero complex numbers such tha $|z_1 + z_2| = |z_1| + |z_2|$ then $arg(z_1) - arg(z_2)$ is equal to

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

B. $-\pi$

C. 0

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

Answer: C

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3. If z and w are two non - zero complex numbers such that $|zw| = 1$ and $arg(z) - arg(w) = \frac{\pi}{2}$, then the value of $5i\bar{z}w$ is equal to

A. $-i$

B. 1

C. -1

D. i

Answer: C

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4. What is the smallest positive integer n for which $(1+i)^{2n} = (1-i)^{2n}$?

A. 1

B. 2

C. 3

D. 4

Answer: B

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5. if z is a complex number such that z+|z|=8+12i, then the value of $\left|z^2\right|$ is equal to

A. 228

B. 144

C. 121

D. 169

Answer: D

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6. Let x_1 and y_1 be real number. If z_1 and z_2 are complex numbers such that $|z_1| = |z_2| = 4$, then $|x_1 z_1 - y_1 z_2|^2 + |y_1 z_1 + x_1 z_2|^2 =$

A. $32(x_1^2 + y_1^2)$

B. $16(x_1^2 + y_1^2)$

C. $4(x_1^2 + y_1^2)$

D. $32(x_1^2 + y_1^2)|z_1 + z_2|^2$

Answer: A

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7. If $|a + ib| = 1$ then the simplified form of $\frac{1 + b + ai}{1 + b - ai}$ is

A. b+ai

B. a+bi

C. $(1+b)^2+a^2$

D. ai

Answer: A

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8. If $z=x-iy$, $z^{\frac{1}{3}}=p+iq$ then $\left(\frac{x}{p}+\frac{x}{q}\right)(p^2+q^2)=$

A. -2

B. -1

C. 2

D. 1

Answer: A

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9. The value of $\frac{i^{592}+i^{590}+i^{588}+i^{586}+i^{584}}{i^{582}+i^{580}+i^{578}+i^{576}+i^{574}}-1$ is -1 b. -2 c. -3 d. -4

A. -2

B. 0

C. -1

D. 1

Answer: A

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10. The greatest and the least absolute value of z+1, where $|z+4| \leq 3$ are respectively

A. 6 and 0

B. 10 an 6

C. 4 and 3

D. None of these

Answer: A

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11. The value of Arg $\left[i\ln\left(\frac{a-ib}{a+ib}\right)\right]$, where a and b are real numbers, is

A. $0 \text{ or } \pi$

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

C. not defined

D. None of these

Answer: A

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12. If z_1, z_2, z_3 are complex numbers such that $|z_1| = |z_2| = |z_3| = \left|\frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_3}\right| = 1$ then $|z_1 + z_2 + z_3|$ is equal to

A. equal to 1

B. less than 1

C. greater than 3

D. equal to 3

Answer: A

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13. The principal value of the arg(z) and lzl of the complex number $z = 1 + \cos\left(\frac{11\pi}{9}\right) + i\sin\left(\frac{11\pi}{9}\right)$ are respectively

A. $\frac{11\pi}{8}, 2\cos\left(\frac{\pi}{18}\right)$

B. $-\frac{7\pi}{18}, -2\cos\left(\frac{11\pi}{18}\right)$

C. $\frac{2\pi}{9}, 2\cos\left(\frac{7\pi}{18}\right)$

D. $-\frac{\pi}{9}, -2\cos\left(\frac{\pi}{18}\right)$

Answer: B

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14. If $z = i^{-39}$, then simplest form of z is equal to a +i. The value of a is

A. 0

B. 1

C. 2

D. 3

Answer: A

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15. If z is a complex number such taht $z^2 = (z)^2$, then find the location of z on the Argand plane.

A. z is purely real

B. z is purely imaginary

C. either z is purely real or purely imaginary

D. None of these

Answer: C

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Exercise 1 Concept Builder Topic 2

1. The value of: $i^{1/3}$ is

A. $\frac{\sqrt{3}+i}{2}$

B. $\frac{\sqrt{3}-i}{2}$

C. $\frac{1+i\sqrt{3}}{2}$

D. $\frac{1-i\sqrt{3}}{2}$

Answer: A

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2. If $\omega = z/[z-(1/3)i]$ and $|\omega| = 1$, then find the locus of z.

A. an ellipse

B. a circle

C. a straight line

D. a parabola

Answer: C

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3. The value of $\left(1+\omega^2+2\omega\right)^{3n}-\left(1+\omega+2\omega^2\right)^{3n}$ is

A. 0

B. 1

C. ω

D. ω^2

Answer: A

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4. If the real part of $\frac{\bar{z}+2}{\bar{z}-1}$ is 4, then show that the locus of the point representing z in the complex plane is a circle.

A. a straight line parallel to x-axis

B. a straight line equally inclined to axes

C. a circle with radius 2

D. a circle with radius $\frac{1}{2}$

Answer: D

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5. $\left(\frac{-1+\sqrt{3}i}{2}\right)^{100}+\left(\frac{-1-\sqrt{3}i}{2}\right)^{100}=$

A. 2

B. 0

C. -1

D. 1

Answer: C

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6. $\sqrt{(-8-6i)}$ is equal to (where, $i=\sqrt{-1}$

A. $1\pm 3i$

B. $\pm(1-3i)$

C. $\pm(1+3i)$

D. $\pm(3-i)$

Answer: B

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7. If $z = x + iy$ and the amplitude of $(z - 2 - 3i)$ is $\frac{\pi}{4}$. Find the relation between x and y.

A. x+y-1=0

B. x-y-1=0

C. x+y+1=0

D. x-y+1=0

Answer: D

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8. The fourth root of $\frac{1}{2}+i\frac{\sqrt{3}}{2}$ is

A. $cis\frac{\pi}{12}$

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

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

D. $\text{cis}\ \frac{\pi}{3}$

Answer: A

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9. If $iz^4+1=0,$ then prove that z can take the value $\cos\pi/8+is\in\pi/8.$

A. $\frac{1+i}{\sqrt{2}}$

B. $\cos\frac{\pi}{8}+I\sin\frac{\pi}{8}$

C. $\frac{1}{4i}$

D. i

Answer: B

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10. The radius of the circle $\left|\frac{z-i}{z+i}\right| = 5$ is given by

A. $\frac{13}{12}$

B. $\frac{5}{12}$

C. 5

D. 625

Answer: B

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Exercise 1 Concept Builder Topic 3

1. The product of the roots of the equation $x|x| - 5x - 6 = 0$ is equal to

A. 36

B. -36

C. -18

D. 6

Answer: D

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2. If $\alpha \neq \beta$ but $\alpha^2 = 5\alpha - 3$ and $\beta^2 = 5\beta - 3$ then the equation having α/β and β/α as its roots is :

A. $3x^2 - 19x + 3 = 0$

B. $3x^2 + 19x - 3 = 0$

C. $3x^2 - 19x - 3 = 0$

D. $x^2 - 5x + 3 = 0$

Answer: A

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3. Product of real roots of the equation $t^2x^2 + |x| + 9 = 0$ a. is always +ve b. is always-ve c. does not exist d. none of these

A. is always positive

B. is always negative

C. does not exist

D. None of these

Answer: A

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4. The number of real solutions of the equation $t^2x^2 + |x| + 9 = 0$

A. 3

B. 2

C. 4

D. 1

Answer: B

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5. If α, β are real and α^2, β^2 are the roots of the equation $a^2x^2 - x + 1 - a^2 = 0\left(\frac{1}{\sqrt{2}} < a < 1\right)$ and $\beta^2 \neq 1$, then $\beta^2 =$

A. a^2

B. $\frac{1-a^2}{a^2}$

C. $1 - a^2$

D. $1 + a^2$

Answer: B

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6. if $y = 2 + \left(\frac{1}{4 + \left(\frac{1}{4 + \left(\frac{1}{4 + - - - \infty}\right)}\right.}\right.$ then y = ?

A. y=6

B. y=5

C. $y = \sqrt{6}$

D. $y = \sqrt{5}$

Answer: D

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7. The root of the equation $3^{2x} - 10.3^{x} + 9 = 0$ are

A. 1,2

B. 0,2

C. 0,1

D. 1,3

Answer: B

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8. If the equation $(m-n)x^2+(n-1)x+1-m=0$ has equal roots, then l, m and n satisfy

A. 2l=m+n

B. 2m=n+l

C. m=n+l

D. l=m+n

Answer: B

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9. If α and $\beta(\alpha < \beta)$ are the roots of the equation $x^2 + bx + c = 0$, where $c < 0 < b$, then

A. $0 < \alpha < \beta$

B. $\alpha < 0 < \beta < |\alpha|$

C. $\alpha < \beta < 0$

D. $\alpha < 0 < |\alpha| < \beta$

Answer: B

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10. The real roots of the equation $x^{2/3} + x^{1/3} - 2 = 0$ are

A. 1,8

B. $-1, \ -8$

C. $-1, 8$

D. $1, \ -8$

Answer: D

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11. The values of a for which the equation $2x^2 - 2(2a+1)x + a(a+1) = 0$ may have one root less them a and other root greater than a are given by

A. $1 > a > 0$

B. $-1 > a < 0$

C. $1 \geq a$

D. $a > 0 \text{ or } a < 01$

Answer: D

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12. If the roots of the equation $x^2 + 2ax + b = 0$ are real and distinct and they differ by at most $2m, thenb$ lies in the interval $(a^2, a^2, +m^2)$ b. $(a^2 - m^2, a62)$ c. $[a^2 - m^2, a^2)$ d. none of these

A. $(a^2 - m^2, a^2)$

B. $[a^2 - m^2, a^2]$

C. $(a^2, a^2 + m^2)$

D. None of these

Answer: B

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13. If one root of the equation $ax^2 + bx + c = 0$ is the square of the other , then

A. 3abc

B. $-3abc$

C. 0

D. None of these

Answer: A

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14. The ration of roots of the equations $ax^2 + bx + c = 0$ and px^(2) + qx + r = 0 $\text{are equal. If } D_1 \text{ and } D_2$ are respective discriminates. Then what is $\frac{D_1}{D_2}$ equal to ?

A. a^2/p^2

B. b^2/q^2

C. c^2/r^2

D. None of these

Answer: B

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15. If $x^2 + y^2 = 25, xy = 12$ then x=

A. {3,4}

B. {3,-3}

C. {3,4,-3,-4}

D. {-3,-3}

Answer: C

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16. If $a, b, c(abc^2)x^2 + 3a^2cx + b^2cx - 6a^2 - ab + 2b^2 = 0$ ares rational.

A. non-real

B. rational if a, b, c, are rational

C. irrational if a,b,c are rational

D. None of these

Answer: B

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17. Find the roots of the following equations.

$x^2 - 7x + 12 = 0$

A. 1

B. 2

C. 3

D. 4

Answer: D

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18. If $0 < a < b < c$ and the roots α, β of the equation $ax^2 + bx + c = 0$ are imaginary, then

A. $|\alpha| = |\beta|$

B. $|\alpha| > 1$

C. $|\beta| < 1$

D. None of these

Answer: C

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19. Let $p, q, r, s \in R, x^2 + px + q = 0, x^2 + rx + s = 0$ such that $2(q + s) = pr$ then

A. Both the equations always have real roots.

B. At least one equation always has real roots

C. Both the equation always have non real roots

D. At least one equation always has real and equal roots.

Answer: B

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Exercise 1 Concept Builder Topic 4

1. If a root of the equations $x^2 + px + q = 0$ and $x^2 + \alpha x + \beta = 0$ is common, then its value will be $(\text{where } p \neq \alpha \text{ and } q \neq \beta)$

A. $\dfrac{q - B}{\alpha - p}$

B. $\dfrac{p\beta - \alpha q}{q - B}$

C. $\dfrac{q - B}{\alpha - p}$ or $\dfrac{p\beta - \alpha q}{q - B}$

D. None of these

Answer: C

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2. If the equations $x^2 + bx - 1 = 0$ and $x^2 + x + b = 0$ have a common root different from -1 then $|b|$ is equal to

A. $-\sqrt{2}$

B. $-i\sqrt{3}$

C. $i\sqrt{5}$

D. $\sqrt{2}$

Answer: B

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3. If both the roots of $k(6x^2 + 3) + rx + 2x^2 - 1 = 0$ and $6k(2x^2 + 1) + px + 4x^2 - 2 = 0$ are common, then $2r - p$ is

equal to

A. -1

B. 0

C. 1

D. 2

Answer: B

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4. Let a, b, c be real numbers, $a \neq 0$. If α is a zero of $a^2x^2 + bx + c = 0, \beta$ is the zero of $a^2x^2 - bx - c = 0$ and $0, \alpha < \beta$ then prove that the equation $a^2x^2 + 2bx + 2c = 0$ has a root γ that always satisfies $\alpha < \gamma < \beta$.

A. $\gamma = \frac{\alpha + \beta}{2}$

B. $\gamma = \frac{\alpha - \beta}{2}$

C. $\gamma = \alpha$

D. $\alpha < \gamma < \beta$

Answer: D

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5. Let p and q be the roots of the quadratic equation $x^2 - (\alpha - 2)x - \alpha - 1 = 0$. What is the minimum possible value of $p^2 + q^2$?

A. 2

B. 3

C. 6

D. 5

Answer: D

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6. If $x^2 + ax + 10 = 0$ and $x^2 + bx - 10 = 0$ have common root, then $a^2 - b^2$ is equal to

A. 10

B. 20

C. 30

D. 40

Answer: D

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Exercise 1 Concept Builder Topic 5

1. The number of integral solutions of $\frac{x+2}{x^2+1} > \frac{1}{2}$ is 4 2. 5 3. 3 4. 2 5. 6

A. 4

B. 5

C. 3

D. None of these

Answer: C

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2. If $b^2 > 4ac$, then $a\left(x^2+4x+4\right)^2 + b\left(x^2+4x+4\right) + c = 0$ has distinct real roots if :

A. $b < a < 0 < c$

B. $a < b < 0 < c$

C. $b < 0 < a < c$

D. $c < 0 < b < a$

Answer: C

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3. Let $a > 0, b > 0$ and $c > 0$. Then, both the roots of the equation $ax^2 + bx + c = 0$. (1979, 1M) are real and negative have negative real parts have positive real parts None of the above

A. are real and negative

B. have negative real parts

C. are rational numbers

D. None of these

Answer: B

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4. for all $x \in R$ if $mx^2 - 9mx + 5m + 1 > 0$ then m lies in the interval

A. $\left(-\frac{4}{61}, 0\right)$

B. $\left[0, \frac{4}{61}\right]$

C. $\left[0, \frac{4}{61}\right]$

D. None of these

Answer: C

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5. The solution set of the inequation $\frac{x^2 - 3x + 4}{x + 1} > 1, x \in \mathbb{R}$, is

A. $(3, +\infty)$

B. $(-1, 1) \cup (3, +\infty)$

C. $[-1, 1] \cup [3, +\infty)$

D. None of these

Answer: B

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6. $x^2 - 5x + 6 > 0$

A. $(-\infty, 2) \cup (3, \infty)$

B. [2,3]

C. (2,3)

D. None of these

Answer: A

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7. If x is real, then $x/\left(x^2-5x+9\right)$ lies between $-1and-1/11$

b. $1and-1/11$ c. $1and1/11$ d. none of these

A. $\frac{1}{11}$ and 1

B. -1 and $\frac{1}{11}$

C. -11 and 1

D. $-\frac{1}{11}$ and 1

Answer: D

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8. If $x \in R$ and $b < c$, then $\frac{x^2 - bc}{2x - b - c}$ has no values

A. (b,c)

B. [b,c]

C. $(-\infty, b] \cup [c, \infty)$

D. $(-\infty, b) \cup (c, \infty)$

Answer: C

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9. If a and b are the odd integers, then the roots of the equation,

$2ax^2 + (2a + b)x + b = 0, a \neq 0$, will be

A. rational

B. irrational

C. non-real

D. equal

Answer: A

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10. If the roots of the equation $x^2 - 2ax + a^2 - a - 3 = 0$ are ra

and less than 3, then $a < 2$ b. $2 < \ -a \leq 3$ c. `34`

A. $a < 2$

B. $2 \leq a \leq 3$

C. $3 < a \leq 4$

D. $a > 4$

Answer: A

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Exercise 2 Concept Applicator

1. If $z_1 = \sqrt{2}\left(\frac{\cos\pi}{4} + i\sin\left(\frac{\pi}{4}\right)\right)$ and $z_2 = \sqrt{3}\left(\frac{\cos\pi}{3} + i\sin\left(\frac{\pi}{3}\right)\right)$ then $|z_1 z_2| =$

A. 6

B. 3

C. 2

D. 5

Answer: A

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2. If $x + iy = \frac{3}{2 + \cos\theta + i\sin\theta}$, then show that $x^2 + y^2 = 4x - 3$

A. 2

B. 3

C. 4

D. 5

Answer: B

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3. Write the complex number $z = \frac{i - 1}{\frac{\cos\pi}{3} + i\frac{\sin\pi}{3}}$ in polar form.

A. $\sqrt{2}\left(\cos\frac{5\pi}{12} - i\sin\frac{5\pi}{12}\right)$

B. $\sqrt{\cos\frac{5\pi}{12} + I\sin\frac{5\pi}{12}}$

C. $\sqrt{\cos\frac{\pi}{4} + I\sin\frac{\pi}{4}}$

D. $\sqrt{\cos\frac{\pi}{4} - I\sin\frac{\pi}{4}}$

Answer: B

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4. A variable complex number $z = x + iy$ is such that $ar\frac{g(z-1)}{z+1} = \frac{\pi}{2}$. Show that $x^2 + y^2 - 1 = 0$.

A. $x^2 - y^2 - 2x = 1$

B. $x^2 + y^2 - 2x = 1$

C. $x^2 + y^2 - 2y = 1$

D. $x^2 + y^2 + 2x = 1$

Answer: C

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5. If $arg(z) < 0,$ then find $arg(-z) - arg(z).$

A. π

B. $-\pi$

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

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

Answer: A

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6. If $f(z) = \frac{7-z}{1-z^2}$, where $z = 1 + 2i,$ then $|f(z)|$ is $\frac{|z|}{2}$ (b) $|z|$ (c) $2|z|$ (d) none of these

A. $\frac{|z|}{2}$

B. $|z|$

C. 2|z|

D. None of these

Answer: A

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7. If $z = x + iy, z^{\frac{1}{3}} = a - ib$ and $\frac{x}{a} - \frac{y}{b} = \lambda(a^2 - b^2)$, then λ is equal to

A. 2

B. 4

C. 6

D. 1

Answer: B

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8. Amplitude of $\frac{1+\sqrt{3}i}{\sqrt{3}+1}$ is

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

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

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

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

Answer: C

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9. If $z = \frac{3-i}{2+i} + \frac{3+i}{2-i}$ then value of arg (zi) is

A. 0

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

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

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

Answer: D

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10. If $(y^2 - 5y + 3)(x62 + x + 1) < 2x$ for all $x \in R,$ then fin the interval in which y m lies.

A. $(-\infty, -2]$

B. $\left(\frac{5-\sqrt{5}}{2}, \frac{5+\sqrt{5}}{2}\right)$

C. $\left[\frac{5+\sqrt{5}}{2}, \infty\right)$

D. $\left[\frac{5+\sqrt{5}}{2}, -\frac{2}{3}\right]$

Answer: B

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11. Let $x + \frac{1}{x} = 1$ and a, b and c are distict positive integer such that $\left(x^a + \frac{1}{x^a}\right) + \left(x^b + \frac{1}{x^b}\right) + \left(x^c + \frac{1}{x^c}\right) = 0$

Then the minimum value of (a+b+c) is

A. 7

B. 8

C. 9

D. 10

Answer: C

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12. If $z = (3+7i)(a+ib)$, where $a, b \in Z - \{0\}$, is purely imaginery, then minimum value of $|z|^2$ is

A. 0

B. 58

C. $\frac{3364}{3}$

D. 3364

Answer: D

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13. The value of λ for which the sum of squares of roots of the equation $x^2 + (3-\lambda)x + 2 = \lambda$ is minimum, then λ is equal to (a) 2 (b) -1 (c) -3 (d) -2

A. $3/2$

B. 1

C. $1/2$

D. $11/4$

Answer: C

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14. The set of all real numbers x for which $x^2 - |x+2| + x > 0$ is

A. $(-\infty, -2) \cup (2, \infty)$

B. $(-\infty, -\sqrt{2}) \cup (\sqrt{2}, \infty)$

C. $(-\infty, -1) \cup (1, \infty)$

D. $(\sqrt{2}, \infty)$

Answer: B

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15. If α, β are the roots of the equation $ax^2 + bx + c = 0$, then $\frac{\alpha}{\alpha\beta + b} + \frac{\beta}{a\alpha + b}$ is equal to -

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

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

C. $\frac{2}{c}$

D. $-\frac{2}{a}$

Answer: D

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16. If $\log_{\frac{1}{2}}\left(\frac{x^2 + 6x + 9}{2(x+1)}\right) < -\log_2(x+1)$ then complete set of values of x is

A. $\left(-1, \ -1+2\sqrt{2}\right)$

B. $\left(1-2\sqrt{2}, 2\right)$

C. $\left(-1, \infty\right)$

D. None of these

Answer: A

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17. Solve: $x^2+2=0$

A. 1

B. 2

C. 3

D. 4

Answer: B

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18. If `a

A. real and equal

B. complex

C. real an unequal

D. None of these

Answer: C

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19. If the cube roots of unity are $1, ww^2$,then the roots of the equation $(x-1)^3+8=0$, are

A. $-1, 1+2w, 1-2w^2$

B. $-1, \ -1, \ -1$

C. $-1, 1-2w, 1-2w^2$

D. None of these

Answer: C

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20. Find t values of the parameter a such that the rots α, β of the equation $2x^2+6x+a=0$ satisfy the inequality $\alpha/\beta+\beta/\alpha<2.$

A. $a > 0$

B. $a < 9/2$

C. $a < 0 \text{ or } a > 9/2$

D. None of these

Answer: C

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21. If w is a complex cube root of unity, then the value of $w^{99} + w^{100} + w^{101}$ is

A. 1

B. -1

C. 3

D. 0

Answer: D

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22. If α and β are the roots of the equation $x^2 + px + \frac{3p}{4} = 0$ such that $|\alpha - \beta| = \sqrt{10}$ then p belongs to the set

A. {2,-5}

B. {-3,2}

C. {-2,5}

D. {3,-5}

Answer: C

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23. The quadratic equations $x^2 6x + a = 0 and x^2 cx + 6 = 0$ have one root in common. The other roots of the first and second equations are integers in the ratio 4 : 3. Then the common root is

(1) 1 (2) 4 (3) 3 (4) 2

A. 1

B. 4

C. 3

D. 2

Answer: D

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24. If x be real, then the minimum value of $x^2 - 8x + 17$ is

A. -1

B. 0

C. 1

D. 2

Answer: C

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25. If one root of the equations $ax^2 + bx + c = 0$ and $bx^2 + cx + a = 0, (a, b, c \in R)$ is common, then the value of $\left(\frac{a^3 + b^3 + c^3}{abc}\right)^3$ is

A. 1

B. 3

C. 9

D. 27

Answer: D

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26. State true or false for the following.

The inequality $|z-4| < |z-2|$ represents the region given by $x > 3$.

A. $Re(z) > 0$

B. $Re(z) < 0$

C. $Re(z) > 3$

D. $Re(z) > 2$

Answer: C

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27. If $1, \alpha_1, \alpha_2, \alpha_3, \alpha_4$ be the roots $x^5 - 1 = 0$, then value of $\frac{\omega - \alpha_1}{\omega^2 - \alpha_1} \cdot \frac{\omega - \alpha_2}{\omega^2 - \alpha_2} \cdot \frac{\omega - \alpha_3}{\omega^2 - \alpha_3} \cdot \frac{\omega - \alpha_4}{\omega^2 - \alpha_4}$ is (where ω is imaginary cube root of unity)

A. 1

B. ω

C. ω^2

D. None of these

Answer: B

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28. If z be any complex number $(z \neq 0)$ then $arg\left(\frac{z - i}{z + i}\right) = \frac{\pi}{2}$ represents the curve

A. 0

B. 1

C. 2

D. 3

Answer: A

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29. Let z_1 and z_2 be theroots of the equation $z^2 + az + b = 0$ z being compex. Further, assume that the origin z_1 and z_2 form an equilatrasl triangle then (A) $a^2 = 4b$ (B) $a^2 = b$ (C) $a^2 = 2b$ (D) `a^2=3b

A. $a^2 = 4b$

B. $a^2 = b$

C. $a^2 = 2b$

D. $a^2 = 3b$

Answer: D

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30. Consider $f(x) = x^2 - 3x + a + \frac{1}{a}, a \in R - \{0\},$ such that $f(3) > 0$ and $f(2) \leq 0.$ If α and β are the roots of equation $f(x) = 0$ then the value of $\alpha^2 + \beta^2$ is equlal to

A. greater than 11

B. less than 5

C. 5

D. depends upon a and a cannot be determined the locus arg

Answer: C

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