MATHS

NCERT - NCERT MATHEMATICS(BENGALI)

COMPLEX NUMBERS AND QUADRATIC EQUATIONS

Examples

1. If 4x + i(3x-y) =3+ i(-6), where x and y are real numbers, then find the values of x and y.

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2. Express the following in the form of a+bi,

(i) $(-5i)\left(\frac{1}{8}i\right)$, (ii) $(-i)(2i)\left(-\frac{1}{8}i\right)^3$

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3. Express $(5-3i)^3$ in the form a+ib.

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4. Express $\left(-\sqrt{3}+\sqrt{-2}\right)\left(2\sqrt{3}-i\right)$, in the form of a+ib.


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5. Find the multiplicative inverse of 2-3i.


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6. Express the following in the form a+ib.

(i) $\frac{5+\sqrt{2}i}{1-\sqrt{2}i}$, (ii) i^{-35}

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7. Represent the complex number $z = 1 + i\sqrt{3}$ in the polar form.

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8. Convert the complex number $\frac{-16}{1+i\sqrt{3}}$ into polar form.

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9. Solve $x^2+2=0$

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10. Solve $x^2+x+1=0$

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11. Solve $\sqrt{5}x^2 + x + \sqrt{5} = 0$

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Miscellaneous Examples

1. Find the conjugate of $\dfrac{(3-2i)(2+3i)}{(1-2i)(2-i)}$

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2. Find the modulus and arguments of the complex numbers.

(i) $\frac{1+i}{1-i}$, (ii) $\frac{1}{1+i}$

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3. If $x+iy=\frac{a+ib}{a-ib}$, prove that $x^2+y^2=1$.

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4. Find real θ such that $\frac{3+2i\sin\theta}{1-2i\sin\theta}$ is purely real.

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

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Exercise 5 1

1. Express each of the complex number given in the form of $a + ib$

$(5i)\left(-\frac{3}{5}i\right)$

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2. Express each of the complex number given in the form of $a + ib$

$i^9 + i^{19}$

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3. Express each of the complex number given in the form of $a + ib$

i^{-39}

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4. Express each of the complex number given in the form of $a + ib$

3(7 + i7)+ i(7 + i7)

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5. Express each of the complex number given in the form of $a + ib$

(1-i) - (-1+i6)

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6. Express each of the complex number given in the form of $a + ib$

$$\left(\frac{1}{5} + i\frac{2}{5} - \left(4 + i\frac{5}{2}\right)\right)$$

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7. Express each of the complex number given in the form of $a + ib$

$$\left[\left(\frac{1}{3}+i\frac{7}{3}\right)+\left(4+i\frac{1}{3}\right)\right]-\left(-\frac{4}{3}+i\right)$$

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8. Express each of the complex number given in the form of $a+ib$

$(1-i)^4$

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9. Express each of the complex number given in the form of $a+ib$

$\left(\frac{1}{3}+3i\right)^3$

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10. Express each of the complex number given in the form of $a+ib$

$\left(-2-\frac{1}{3}i\right)^3$

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11. Find the multiplicative invers of each of the complex number

4-3i

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12. Find the multiplicative invers of each of the complex number

$\sqrt{5} + 3i$

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13. Find the multiplicative invers of each of the complex number

$-i$

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14. Express the following expression in the form of $a + ib$.

$$\left((3 + i\sqrt{5}) \frac{3 - i\sqrt{5}}{\left(\sqrt{3} + 2i\right) - \left(\sqrt{3} - i\sqrt{2}\right)} \right)$$

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Exercise 5 2

1. Find modulus and argument of the complex numbers

$z = -1 - i\sqrt{3}$

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2. Find modulus and argument of the complex numbers

$z = -\sqrt{3} + i$

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3. Convert each of the complex number in the polar form:

1-i

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4. Convert each of the complex number in the polar form:

$-1+i$

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5. Convert each of the complex number in the polar form:

$-1-i$

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6. Convert each of the complex number in the polar form:

-3

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7. Convert each of the complex number in the polar form:

$\sqrt{3} + i$

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8. Convert each of the complex number in the polar form:

i

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Exercise 5 3

1. Solve the following: $x^2 + 3 = 0$

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2. $2x^2 + x + 1 = 0$

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3. $x^2 + 3x + 9 = 0$

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4. $-x^2 + x - 2 = 0$

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

6. $x^2 - x + 2 = 0$

7. $\sqrt{2}x^2 + x + \sqrt{2} = 0$

8. $\sqrt{3}x^2 - \sqrt{2}x + 3\sqrt{3} = 0$

9. $x^2 + x + \frac{1}{\sqrt{2}} = 0$

10. $x^2 + \frac{x}{\sqrt{2}} + 1 = 0$

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Miscellaneous Exercises On Chapter 5

1. Evaluate $\left[i^{18} + \left(\frac{1}{i}\right)^{25}\right]^3$

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Miscellaneous Exercises On Chapter 6

1. For any two complex numbers z_1 and z_2, prove that $Re(z_1 z_2) = Rez_1 Rez_2 - Imz_1 Imz_2$

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Miscellaneous Exercises On Chapter 7

1. Reduce $\left(\frac{1}{1-4i} - \frac{2}{1+i}\right)\left(\frac{3-4i}{5+i}\right)$ to the standard form.

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Miscellaneous Exercises On Chapter 8

1. If $x - iy = \sqrt{\frac{a + ib}{c - id}}$, prove that $\left(x^2 + y^2\right)^2 = \frac{a^2 + b^2}{c^2 + d^2}$

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Miscellaneous Exercises On Chapter 9

1. Convert the following in the polar form $\frac{1 + 3i}{1 - 2i}$

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Miscellaneous Exercises On Chapter 10

1. Solve:

$$3x^2 - 4x + \frac{20}{3} = 0$$

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Miscellaneous Exercises On Chapter 11

1. $x^2 - 2x + \frac{3}{2} = 0$

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Miscellaneous Exercises On Chapter 12

1. $27x^2 - 10x + 1 = 0$

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Miscellaneous Exercises On Chapter 13

1. $21x^2 - 28x + 10 = 0$

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Miscellaneous Exercises On Chapter 14

1. If $z_1 = 2 - i, z_2 = 1 + i$, find $\left| \frac{z_1 + z_2 + 1}{z_1 - z_2 + 1} \right|$

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Miscellaneous Exercises On Chapter 15

1. If $a + ib = \frac{(x+i)^2}{2x^2+1}$, prove that $a^2 + b^2 = \frac{\left(x^2+1\right)^2}{\left(2x^2+1\right)^2}$

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Miscellaneous Exercises On Chapter 16

1. Let $z_1 = 2 - i, z_2 = -2 + i$, Find

$$\left(Re\frac{z_1 z_2}{\bar{z}_1}\right)$$

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Miscellaneous Exercises On Chapter 17

1. Find the modulus and argument of the complex number $\frac{1+2i}{1-3i}$

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Miscellaneous Exercises On Chapter 18

1. Find the real numbers x and y if (x-iy) (3+5i) is the conjugate of $-6-24i$.

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Miscellaneous Exercises On Chapter 19

1. Find the modulus of $\frac{1+i}{1-i}-\frac{1-i}{1+i}$

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Miscellaneous Exercises On Chapter 20

1. If $(x+iy)^3 = u+iv$, then show that $\frac{u}{x}+\frac{v}{y} = 4\left(x^2-y^2\right)$

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Miscellaneous Exercises On Chapter 21

1. If α and β are different complex numbers with $|\beta| = 1$, then find $\left|\frac{\beta - \alpha}{1 - \overline{\alpha}\beta}\right|$

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Miscellaneous Exercises On Chapter 22

1. Find the numbers of non-zero integral solutions of the equation $|1 - i|^x = 2^x$

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Miscellaneous Exercises On Chapter 23

1. If

$$(a+ib)(c+id)(e+\quad \text{if} \quad)(g+ih) = A+iB$$

, then show that

$$\left(a^2+b^2\right)\left(c^2+d^2\right)\left(e^2+f^2\right)\left(g^2+h^2\right) = A^2+B^2$$

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Miscellaneous Exercises On Chapter 24

1. If $\left(\frac{1+i}{1-i}\right)^m = 1$, then find the least positive integral value of m.

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