Saitech Informatics

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COMPLEX NUMBERS

Class 11 - Mathematics

Time Allowed: 1 hour and 30 minutes **Maximum Marks: 45**

1. If (a + b) - i(3a + 2b) = 5 + 2i, find a and b. **[1]**
2. If z_1 = 2 - iy and z_2 = x + 3i are equal, find x and y. **[1]**
3. Find the sum of the complex number (2 + i3), (- 6 + i7). **[1]**
4. Express (5 + 4 i) + (5 - 4 i) in the form of a + ib. **[1]**
5. Express the complex number (1 - i) - (- 1 + i6) in form of a + ib. **[1]**
6. Find the difference of the complex numbers (- 4 + 7i), (- 11 - 23i) **[1]**
7. What is the reciprocal of 3 + $\sqrt{7}$ i **[1]**
8. Express $\frac{1}{3-4i}$ in the standard form a + ib: **[1]**
9. Find the values of x and y if (x + iy) (4 + 5i) = 6 - 2i **[3]**
10. Evaluate $\left[\frac{1}{1-4i}-\frac{2}{1+i}\right]\left[\frac{3-4i}{5+i}\right]$ to the standard form. **[3]**
11. Express $\frac{5+4i}{4+5i}$ in the standard form a + ib: **[1]**
12. Express $\frac{2+3i}{4+5i}$ the complex numbers in the standard form a + ib. **[1]**
13. What is the smallest positive integer n, for which $(1 + i)^{2n} = (1 - i)^{2n}$? **[1]**
14. Simplify: $(-2i)\left(\frac{1}{6}i\right)$ **[1]**
15. Evaluate: $\sqrt{4i}$. **[3]**
16. Write the values of the square root of i. **[3]**
17. Find the square root of i. **[3]**
18. If x - iy = $\sqrt{\frac{a-ib}{c-id}}$, then prove that $x^2 + y^2 = \sqrt{\frac{a^2+b^2}{c^2+d^2}}$. **[5]**
19. Show that $\left|\frac{z-2}{z-3}\right|$ = 2 represents a circle. Find its centre and radius. **[2]**
20. Let $z_1 = r_1(\cos\theta_1 + i\sin\theta_1)$ and $z_2 = r_2(\cos\theta_2 + i\sin\theta_2)$ be two complex numbers. Then, prove that **[3]**

    i. $|z_1 + z_2|^2 = r_2^2 + r_2^2 + 2\, r_1\, r_2 \cos(\theta_1 - \theta_2)$

    or $|z_1 + z_2|^2 = |z_1|^2 + |z_2|^2 + 2|z_1||z_2|\cos(\theta_1 - \theta_2)$

    ii. $|z_1 - z_2|^2 = r_2^2 + r_2^2 + 2\, r_1\, r_2 \cos(\theta_1 - \theta_2)$

    or $|z_1 - z_2|^2 = |z_1|^2 + |z_2|^2 - 2|z_1||z_2|\cos(\theta_1 - \theta_2)$
21. A person is represented by a complex number z = x + iy. If a person is represented only by x, then he is not sensitive towards the environment and if a person is represented only by y, then he is sensitive towards the environment. If a person is related by the relation $\left|\frac{z-5i}{z+5i}\right|$ = 1, do you think that the person is Eco - friendly? **[3]**
22. Solve the equation |z| = z +1 + 2i. **[5]**