MATHS

BOOKS - KC SINHA ENGLISH

COMPLEX NUMBERS - FOR BOARDS

Solved Examples

1. Write the complex number: $5 - 7\sqrt{-21}$

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2. Write the complex number: $\frac{\sqrt{3}}{2} - \frac{\sqrt{-2}}{7}$

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3. Write the complex number: $\sqrt{x}, (x > 0)$

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4. Write the complex number: $-b + \sqrt{-4ac}, (a, c > 0)$

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5. Write the real and imaginary part of the complex number: $\frac{\sqrt{17}}{2} + i\frac{2}{\sqrt{70}}$

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6. Write the real and imaginary part of the complex number: $\sqrt{37} + \sqrt{-19}$

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7. Find a and b such that $2a + i4b \text{ and } 2i$ represent the same complex number.

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8. Find the multiplicative inverse of the following complex number: $3 + 2i$

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9. Find Multiplicative Inverse of $\frac{3 + 4i}{4 - 5i}$

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10. Find the sum and product of the complex numbers $-\sqrt{3} + \sqrt{-2}$ and $2\sqrt{3} - i$

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11. Explain the fallacy in the following:

$-1 = i.\, i = \sqrt{-1}.\, \sqrt{-1} = \sqrt{(-1)(-1)} = \sqrt{1} = 1$

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12. Evaluate: i^{80}

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13. Evaluate: $\frac{1}{i}$

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14. Evaluate: $\left(-\sqrt{-1}\right)^{31}$

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15. Evaluate: $\frac{i^2+i^4+i^6+i^7}{1+i^2+i^3}$

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16. simplify : $i^{n+100}+i^{n+50}+i^{n+48}+i^{n+46}$

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17. Simplify: $\left(\frac{1+i}{1-i}\right)^{200}$

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18. Evaluate: $\left[i^{19}+\left(\frac{1}{i}\right)^{25}\right]^2$

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19. Write the complex number in a+ib form: $z = \dfrac{2+i}{(1+i)(1-2i)}$

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20. Express: $\dfrac{(1+i)^3}{4+3i}$ in the form $a+ib$

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21. Express each one of the following in the standard form $a+ib$: $\left(\dfrac{1}{1-2i}+\dfrac{3}{1+i}\right)\left(\dfrac{3+4i}{2-4i}\right)$

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22. Express each one of the following in the standard form $a+ib$: $\dfrac{1}{1-\cos\theta+2i\sin\theta}$

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23. If z_1 and z_2 are $1-i$ and $-2+4i$ respectively find $Im\left(\frac{z_1 z_2}{\bar{z}_1}\right)$

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24. If Z = $x^2 - 7x - 9yi$ such that $\overline{Z} = y^2 i + 20i - 12$ then the number of order pair (x,y) is :

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25. Find the real values of x and y, if : $\frac{(1+i)x - 2i}{3+i} + \frac{(2-3i)y + i}{3-i} = i$

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26. solve $z + 2 = \frac{1}{4-3i}$, where z is a complex number

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

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28. If $x=\frac{1}{2}(5-3i)$, then find the value of $x^4-x^3-12x^2+23x+12$

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29. Find the square root of $7\text{-}24i$

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30. Find the square root of $4+4\sqrt{3}i$

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31. Find square root of $8-15i$

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32. Find the square root of $7 - 30\sqrt{-2}$

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33. Find all possible values of $\sqrt{i} + \sqrt{-i}$.

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34. Find the square root of the following:

$$\frac{x^2}{y^2} + \frac{y^2}{x^2} - \frac{1}{i}\left(\frac{x}{y} - \frac{y}{x}\right) - \frac{9}{4}$$

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35. If ω, ω^2 be imaginary cube root of unity then $\left(3 + 3\omega + 5\omega^2\right)^6 - \left(2 + 6\omega + 2\omega^2\right)^3$ is equal to

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36. If w is a complex cube root of unity then show that $(2-w)\left(2-w^2\right)\left(2-w^{10}\right)\left(2-w^{11}\right)=49$?

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37. If ω is an imaginary cube root of unity, then show that $(1-\omega)\left(1-\omega^2\right)\left(1-\omega^4\right)\left(1-\omega^5\right)=9$

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38. If ω is an imaginary cube root of unity, then show that $\left(1-\omega+\omega^2\right)^5+\left(1+\omega-\omega^2\right)^5=32$

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39. Show that $\left(\frac{-1+\sqrt{3}i}{2}\right)^n + \left(\frac{-1-\sqrt{3}i}{2}\right)^n$ is equal to 2 when n is a multiple of 3 and is equal to -1 when n is any other positive integer.

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40. If $1; w; w^2$ are cube root of unity and n is a positive integer;then $1 + w^n + w^{2n}$ = {3; When n is multiple of 3; 0; when n is not a multiple of 3

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41. If ω be an imaginary cube root of unity, show that $1 + \omega^n + \omega^{2n} = 0$, for n=2,4

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42. (i) If α,β be the imaginary cube root of unity, then show that $\alpha^4+\beta^4+\alpha^{-1}\beta^{-1}=0$

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43. Show that $\sqrt{\left[-1\sqrt{\left\{-1-\sqrt{-1+\ldots\text{to}\infty}\right\}}\right]}=\omega,\ \text{or}\ \omega^2$

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44. Prove that $x^{3p}+x^{3q+1}+x^{3r+2}$ is exactly divisible by x^2+x+1, if p,q,r is integer.

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45. Prove that $\left(\frac{i-\sqrt{3}}{i+\sqrt{3}}\right)^{100}+\left(\frac{i+\sqrt{3}}{i-\sqrt{3}}\right)^{100}=-1$

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46. $x + \frac{1}{x} = -1$ then find the value of $x^{2000} + \frac{1}{x^{2000}}$

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47. If the cube roots of unity are $1, \omega, \omega^2,$ then the roots of the equation $(x-1)^3 + 8 = 0$ are a. $-1, 1+2\omega, 1+2\omega^2$ b. $-1, 1-2\omega, 1-2\omega^2$ c. $-1, -1, -1$ d. none of these

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48. If α, β and γ are the cube roots of $P(p) < 0),$ then for any $x, y,$ and $z,$ $\frac{x\alpha + y\beta + z\gamma}{x\beta + y\gamma + z\alpha}$ is equal to

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49. The value of $\frac{a+b\omega+c\omega^2}{b+c\omega+a\omega^2} + \frac{a+b\omega+c\omega^2}{c+a\omega+b\omega^2}$ (where $'\omega'$ is the imaginary cube root of unity), is (a) $-\omega$ (b). ω^2 (c). 1 (d). -1

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50. about to only mathematics

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51. If $x = a + b, y = a\omega + b\omega^2$ and $z = a\omega^2 + b\omega, provet\hat{x}yz = a^3 + b^3$

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52. If

$x = a + b, y = a\omega + b\omega^2$ and $z = a\omega^2 + b\omega, provet\hat{x}yz = a^3 + b^3$

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53. ω is an imaginary root of unity. Prove that

$\left(a + b\omega + c\omega^2\right)^3 + \left(a + b\omega^2 + c\omega^{\square}\right)^3$

$= (2a - b - c)(2b - a - c)(2c - a - b)$.

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54. Resolve into linear factors $a^2 + b^2 + c^2 - ab - bc - ca$

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55. Find the complex conjugates of $2 + i5, \ -6 - i7$ and $\sqrt{3}$

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56. Find the conjugate, modulus and argument of $\sqrt{2} - \sqrt{2}i$

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57. Find the conjugate and modulus of the following complex number

$(3 - 2i)(3 + 2i)(1 + i)$

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58. Find the modulus and argument of the complex number $\frac{2+i}{4i+(1+i)^2}$

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59. Find the modulus and principal argument of the following complex number: $\frac{5}{2}(\cos 30^0 + i\sin 30^0)$

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60. Find the modulus and principal argument of the following complex number: $\cos 70^0 + i\cos 20^0$

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61. about to only mathematics

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62. For any two complex numbers z_1 and z_2 prove that: $|z_1+z_2|^2+|z_1-z_2|^2=2\left[|z_1|^2+|z_2|^2\right]$

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63. For any two complex numbers z_1 and z_2 prove that: $|z_1+z_2|^2=|z_1|^2+|z_2|^2+2Re\bar{z}_1z_2$

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64. If $|z_1|=|z_2|=\cdots=|z_n|=1$, then show that $|z_1|=|z_2|=\cdots=|z_n|=\left|\frac{1}{z_1}+\frac{1}{z_2}+\frac{1}{z_3}+\cdots+\frac{1}{z_n}\right|$

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65. If z is a complex number such that $|z| = 1$, prove that $\frac{z-1}{z+1}$ is purely imaginary, what will be your conclusion if $z = 1$?

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

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

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68. 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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69. If $z = x + iy$ prove that $|x| + |y| \leq \sqrt{2}|z|$

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70. If $z = 2 - 3i$ show that $z^2 - 4z + 13 = 0$ and hence find the value of $4z^3 - 3z^2 + 169$.

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71. If z_1 and z_2 are two complex numbers such that $|z_1| = |z_2| + |z_1 - z_2|$ show that Im $\left(\frac{z_1}{z_2}\right) = 0$

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72. Show that for $z \varepsilon C$, $|z| = 0$ if and only if $z = 0$

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73. Solve the equation $2z = |z| + 2i$, where z is a complex number.

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74. Express $\sin 30^0 + i\cos 30^0$ in polar form

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75. Write down the following complex number in polar form: Product of $2\left(\cos 30^0 + i\sin 30^0\right)$ and $3\left(\cos 90^0 + i\sin 90^0\right)$

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76. Write down the following complex number in polar form: Quotient of $12\left(\cos 150^0 + i\sin 150^0\right)$ and $3\left(\cos 60^0 + i\sin 60^0\right)$

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77. Express the following complex number in the polar form: (i) $\frac{1+7i}{(2-i)^2}$ (ii) $\frac{1+3i}{1-2i}$

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78. If $\sqrt{a}+ib=x+iy$ prove that $\sqrt{a}-ib=x-iy$

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79. $(x+iy)^{\frac{1}{3}}=(a+ib)$ then prove that $\left(\frac{x}{a}+\frac{y}{b}\right)=4(a^2-b^2)$

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

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81. if $\frac{3}{2+\cos\theta+i\sin\theta}=a+ib$ then prove that $a^2+b^2=4a-3$

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82. Show that:

$$\left(x^2+y^2\right)^5=\left(x^5-10x^3y^2+5xy^4\right)^2+\left(5x^4y-10x^2y^3+y^5\right)^2$$

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83. Express $\left(1+a^2\right)\left(1+b^2\right)\left(1+c^2\right)$ as the sum of two squares.

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84. If $(1+x)^n=a_0+a_1x+a_2x^2+\ldots.+a_nx^n,$ then $(a_0-a_2+\ldots..)^2+(a_1-a_3+\ldots..)^2$ is equal to (A)3^n (B) 2^n (C) $\left(\frac{1-2^n}{1+2^n}\right)$ (D) none of these

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85. Show that the points representing the complex numbers $(3+2i), (2-i)$ and $-7i$ are collinear

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86. Show that the points representing the complex numbers $3+2i, 5i, -3+2i$ and $-i$ form a square

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87. Let z_1, z_2 and z_3 be three distinct complex numbers , satisfying $|z_1| = |z_2| = |z_3| = 1$. Which of the following is/are true :

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88. Show that the area of the triangle on the Argand diagram formed by the complex number $z, izandz + iz$ is $\frac{1}{2}|z|^2$

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89. Complex numbers z_1, z_2, z_3 are the vertices A, B, C respectively of an isosceles right angled trianglewith right angle at C and $(z_1 - z_2)^2 = k(z_1 - z_3)(z_3 - z_2)$, then find k.

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90. If z_1, z_2, z_3 are the vertices of an isosceles triangle right angled at z_2, then prove that $(z_1)^2 + 2(z_2)^2 + (z_3)^2 = 2(z1 + z3)z2$

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Exercise

1. Write the following as complex numbers : $\sqrt{-27}$

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2. Write the complex number: $\sqrt{-16}$

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3. Write the complex number: $4+\sqrt{-5}$

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4. Write the complex number: $-1-\sqrt{-5}$

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5. Write the complex number: $1+\sqrt{-1}$

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6. Write the real and imaginary parts of the complex number: $2 - i\sqrt{2}$

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7. Write the real and imaginary parts of the complex number: $-\frac{\frac{1}{5} + i}{i}$

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8. Write the real and imaginary parts of the complex number: $\frac{\sqrt{5}}{7}i$

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9. Write the real and imaginary part of the complex number: $\sqrt{37} + \sqrt{-19}$

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10. Write the real and imaginary parts of the complex number: $\frac{\sqrt{37}}{3} + \frac{3}{\sqrt{70}}i$

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11. Find the additive inverse of the following: $-5 + 7i$

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12. Find the additive inverse of the following: $4 - 3i$

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13. Find the additive inverse of the following: 10

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14. Find the sum of the following numbers $\frac{2}{3}+\frac{5}{3}i, -\frac{2}{3}i$ and $-\frac{5}{4}-i$

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15. Find the difference of the following complex number, $-3+2i$ and $13-i$

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16. Find the difference of the complex numbers: $1-i$ and $-1+6i$

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17. Find the product and quotient of the complex numbers $1+i$ and $3+i$.

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18. Find multiplicative inverse of the following: $2 + \sqrt{3}i$

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19. Find multiplicative inverse of the following: $-3 + 4i$

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20. Find multiplicative inverse of the following: $-i$

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21. Find the multiplicative inverse of the complex number $4 + 3i$

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22. Find multiplicative inverse of the following: $\left(\sqrt{5}+i3\right)$

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23. Find multiplicative inverse of the following: $2-4i$

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24. For any two complex numbers $z_1$and z_2, prove that $Re(z_1z_2)=Rez_1Rez_2-|mz_1|mz_2.$

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25. Let $z_1=2-i, z_2=-2+i$. Find (i) Re $\left(\frac{z_1z_2}{\bar{z}_1}\right)$ (ii) Im $\left(\frac{1}{z_1\bar{z}_1}\right)$

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26. Let $z_1 = 2 - i, z_2 = -2 + i$. Find (i) Re $\left(\frac{z_1 z_2}{\bar{z}_1}\right)$ (ii) Im $\left(\frac{1}{z_1 \bar{z}_1}\right)$

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27. Express the following in the form a+ib: $(3 + 2i)(3 - 2i)$

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28. Express the following in the form a+ib: $(i - 2)^2$

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29. Express the following in the form a+ib: $\frac{2 - i}{4 + 3i}$

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30. Express the following in the form a+ib: $\frac{1 + 2i + 3i^2}{1 - 2i + 3i^2}$

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31. Express the following in the form a+ib: $\left(\frac{1+i}{1-i}\right)^2$

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32. Express the following in the form a+ib: $\left(\frac{1+2i}{2+i}\right)^2$

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33. Express the following in the form a+ib: $\frac{6+3i}{2-i}$

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34. Express the following complex numbers in the standard form $a+ib$: $\frac{5+\sqrt{2}i}{1-\sqrt{2}i}$

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35. Evaluate $2i^2 + 6i^3 + 3i^{16} - 6i^{19} + 4i^{25}$

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36. $1 + i^{10} + i^{110} + i^{1000}$

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37. Find the value of $i^n + i^{n+1} + i^{n+2} + i^{n+3}$ for all $n \in N$.

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38. If $\left\{ i^{17} - \left(\frac{1}{i} \right)^{34} \right\}^2 = a + 2i$, then the value of a is

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39. $(-i)^{4n+3}$, where n Is a positive integer.

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40. Simiplify : $\left(\frac{1+i}{1-i}\right)^{4n+1}$ (n is a positive integer)

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41. Simplify the following: $(2i)^3$

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42. Simplify the following: $(8i)\left(-\frac{1}{8}i\right)$

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43. Express the following in the form $a+ib$: $(5i)\left(-\frac{3}{5}i\right)$

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44. Simplify the following: $(-5i)\left(\frac{1}{8}i\right)$

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45. Simplify the following: $(-i)(2i)\left(-\frac{1}{8}i\right)^3$

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46. Simplify the following: i^{-35}

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47. Simplify the following: i^{-39}

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48. Express in the form of complex number $i^9 + i^{19}$

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

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50. Simplify the following: $i^6 + i^8$

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51. $i + i^2 + i^3 + i^4$Find the value of the given term.

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52. Find the value of $i^{12} + i^{13} + i^{14} + i^{15}$

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53. Simplify the following: $i^4 + i^8 + i^{12} + i^{16}$

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54. Write the following in the form $a + ib$: $\frac{1}{(2+i)^2} - \frac{1}{(2-i)^2}$.

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55. Express of the complex number in the form $a + ib$. $\left(\frac{1}{5} + i\frac{2}{5}\right) - \left(4 + i\frac{5}{2}\right)$

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56. The from $a + ib$ is given : $(7 - i2) - (4 + i) + (-3 + i5)$ simplify it.

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57. Express each of the following in the form $a + ib$: $\left\{\left(\frac{1}{3} + \frac{7}{3}i\right) + \left(4 + \frac{1}{3}i\right)\right\} - \left(-\frac{4}{3} + i\right)$

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58. Simplify:$i^3 + (6 + i3) - (20 + i5) + (14 + i3)$

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59. $(7 + i5)(7 - i5)$ find product

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60. Express the following in the form a+ib: $3i^3\left(15i^6\right)$

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61. Express the following in the form a+ib: $\sqrt{3}+(3-i2)-(3-i2)$

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62. Express the following in the form $a+ib$: $(1-i)^4$

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63. Express the following in the form a+ib: $\left(\frac{1}{2}+i2\right)^3$

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64. Express the following in the form a+bi

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

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65. Express each of the following in the form $a+ib$: $3(7+7i)+i(7+7i)$

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66. Express the following in the form a+ib: $(3+5i)(2+6i)$

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67. Express the following in the form a+ib: $\left(\frac{1}{3}+3i\right)^3$

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

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69. Express the following in the form $a+ib$: $(1-i)^4$

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70. Find the following as a single complex number $x+iy$

$(\sqrt{6}+i5)\left(\sqrt{6}-i\frac{1}{5}\right)$

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71. Find the following as a single complex number x+ iy =

$(5+i9)(-3+i4)$

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72. $\left[\left(\sqrt{5}+\frac{i}{2}\right)(\sqrt{5}-i2)\right] \div (6+i5)$

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73. $\frac{\left[\left(\sqrt{2}+i\sqrt{3}\right)+\left(\sqrt{2}-i\sqrt{3}\right)\right]}{\left[\left(\sqrt{3}+1\sqrt{2}\right)+\left(\sqrt{3}-1\sqrt{2}\right)\right]}$

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74. Express each one of the following in the standard form $a+ib$: $\frac{\left(3+i\sqrt{5}\right)\left(3-i\sqrt{5}\right)}{\left(\sqrt{3}+\sqrt{2}i\right)-\left(\sqrt{3}-i\sqrt{2}\right)}$.

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75. Express the following complex numbers in the standard form $a+ib$: $\left(\frac{1}{1-4i}-\frac{2}{1+i}\right)\left(\frac{3-4i}{5+i}\right)$

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

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77. Find x and y if: (i)$(x+iy)+(7-5i)=9+4i$

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78. Find the real values of x *and* y, if $:(x+iy)(2-3i)=4+i$

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79. Find x and y if: $\left(\frac{3}{\sqrt{5}}x-5\right)+i2\sqrt{5}y=\sqrt{2}$

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80. 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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81. Find x and y if: $(3y - 2) + i(7 - 2x) = 0$

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82. If $a = \frac{1+i}{\sqrt{2}}$ find the value of $a^6 + a^4 + a^2 + 1$

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83. If $x = \sqrt{-2} - 1$ find he value of $x^4 + 4x^3 + 6x^2 + 4x + 9$

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84. If $x = 3 + 4i$ (where, $i = \sqrt{-1}$, the value of $x^2 - 12x^3 + 70x^2 - 204x + 225,$ is

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85. If $x = 3 + 2i$ find the value of $x^4 - 4x^3 + 4x^2 + 8x + 39$

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86. Find the square root of $7\text{-}24i$

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87. Find the square roots of the following: $15\backslash \ \ 8i$

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88. Find the square root of the following: i

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89. Find the square roots of the following: $1\backslash \quad +i$

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90. Find the square root of the following complex number: $1-i$

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91. Find the square root of the following complex number: $-11-60\sqrt{-1}$

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92. Find the square root of the following complex number: $-8-6i$

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93. Find the square root of the following complex number: $-5+12i$

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94. Find the square root of $12+4\sqrt{5}i$

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95. find the square roots of following : $\left(6\sqrt{-2}-7\right)$

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96. Find the square roots of : 4ab - $2i\left(a^2-b^2\right)$

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97. Find the square root of $\frac{x^2}{y^2}+\frac{y^2}{x^2}+\frac{1}{2}i\left(\frac{x}{y}+\frac{y}{x}\right)+\frac{31}{16}$

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98. Square root of $\left(x^2+\frac{1}{x^2}\right)-\frac{4}{i}\left(x-\frac{1}{x}\right)-6$ is

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99. Find the square root of the following: $a^2-1+2a\sqrt{-1}$

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100. Find the square root of the following: $a^2-1+2a\sqrt{-1}$

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101. Find $\sqrt{2+3\sqrt{-5}}+\sqrt{2-3\sqrt{-5}}$

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102. Find the value of$(i)\omega^{21}(ii)\omega^{18}$

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103. Find the value of: ω^{768}

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104. Find the value of: ω^{-105}

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105. Find the value of: ω^{-105}

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106. Find the value of: ω^{-364}

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107. Find the value of: ω^{-30}

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108. if $\alpha = \frac{-1+\sqrt{-3}}{2}, \beta = \frac{-1-\sqrt{-3}}{2}$ then prove that $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} + 1 = 0$

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109. If ω be an imaginary cube root of unity, show that $(1+\omega-\omega^2)(1-\omega+\omega^2) = 4$

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110. If $1, \omega, \omega^2$ be three roots of 1, show that: $\left(3+\omega+3\omega^2\right)^6 = 64$

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111. If ω be an imaginary cube root of unity, show that $\left(1+\omega-\omega^2\right)\left(1-\omega+\omega^2\right) = 4$

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112. If $1, \omega, \omega^2$ be three roots of 1, show that: $\left(1-\omega+\omega^2\right)^2 + \left(1+\omega-\omega^2\right)^2 = -4$

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113. If $1, \omega, \omega^2$ be three roots of 1, show that: $(1+\omega)^3 - \left(1+\omega^2\right)^3 = 0$

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114. evaluate $\sqrt{-2+2\sqrt{-2+2\sqrt{-2+\ldots\ldots\ldots\ldots.\infty}}}$

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115. show that $\left(\frac{\sqrt{3}+i}{2}\right)^6+\left(\frac{i-\sqrt{3}}{2}\right)^6=-2$

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116. If $1, \omega, \omega^2$ be the three cube roots of 1, then show that: $(1+\omega)\left(1+\omega^2\right)\left(1+\omega^4\right)\left(1+\omega^5\right)=1$

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117. If $1, \omega, \omega^2$ be the three cube roots of 1, then show that: $(1+\omega)\left(1+\omega^2\right)\left(1+\omega^4\right)\left(1+\omega^8\right)=1$

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118. $\left(2+\omega+\omega^2\right)^3+\left(1+\omega-\omega^2\right)^8-\left(1-3\omega+\omega^2\right)^4=1$

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119. If ω is complex cube root of unity $\left(1-\omega+\omega^2\right)\left(1-\omega^2+\omega^4\right)\left(1-\omega^4+\omega^8\right)\left(1-\omega^8+\omega^{16}\right)$

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120. If $a+b+c=0$ and ω, ω^2 are imaginary cube roots of unity, then $\left(a+b\omega+c\omega^2\right)^3+\left(a+b\omega^2+c\omega\right)^3=$ 3abc (b) 6abc (c) 9 abc (d) 27 abc

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121. If ω be an imaginary cube root of unity, show that $\frac{a+b\omega+c\omega^2}{a\omega+b\omega^2+c}=\omega^2$

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122. If ω be an imaginary cube root of unity, show that $1+\omega^n+\omega^{2n}=0$, for n=2,4

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123. Resolve into linear factors:a^2-ab+b^2

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124. Resolve into the linear factor: a^2+ab+b^2

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125. Resolve into the linear factor: $a^3 + b^3$

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126. Resolve into linear factors:$a^3 - b^3$

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127. Resolve into the linear factor: $a^3 + b^3 + c^3 - 3abc$

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128. If $x = a + b, y = a\omega + b\omega^2$ and $z = a\omega^2 + b\omega$ where ω is an imaginary cube root of unity, prove that $x^2 + y^2 + z^2 = 6ab$.

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129. If ω be an imaginary cube root of unity, show that: $\frac{1}{1+2\omega}+\frac{1}{2+\omega}-\frac{1}{1+\omega}=0.$

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130. Find the cube roots of following:8 and -8

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131. Find the cube roots of following:8 and -8

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132. Find the modulus of the following : $\frac{1-i\sqrt{3}}{2+2i}$

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133. Find the modulus and amplitude of $\frac{2+i}{4i+(1+i)^2}$.

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

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135. Find the modulus and argument of each of the following complex number: $-\sqrt{3}-i$

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136. Find the argument of the following: $\frac{1+i}{-\sqrt{3}i}$

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137. Find the modulus and the arguments of the complex number $z = 1 \quad i\sqrt{}$

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138. Find the modulus of the following complex number: $z = -\sqrt{3} + i$

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139. Find the modulus and argument of the following complex number: $z = \frac{(1+i)^{13}}{(1-i)^{7}}$

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140. Find the modulus and argument of the following complex number: $\frac{1}{1+i}$

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141. Find the modulus and argument of the following complex number: $\frac{1+i}{1-i}$

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

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

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

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145. If $|2z-1|=|z-2|$ prove that $|z|=1$ where z is a complex

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146. If $z=x+iy$ and $w=\frac{1-iz}{z-i}$, show that $|w|=1z$ is purely real.

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147. If $|z-5i|=|z+5i|$, then the locus of z.

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148. If $|z|\leq 4$, then find the maximum value of $|iz+3-4i|$.

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149. If $|z| \leq 4$, then find the maximum value of $|iz + 3 - 4i|$.

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150. about to only mathematics

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151. For any two complex numbers z_1 and z_2 prove that: $|z_1 + z_2|^2 + |z_1 - z_2|^2 = 2\left[|z_1|^2 + |z_2|^2\right]$

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152. Solve the equation $|z| + z = 2 + i$

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153. Change the following complex numbers to Cartesiasn form: $2\left(\cos 0^0 + i\sin 0^0\right)$

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154. Change the following complex numbers to Cartesiasn form: $5\left(\cos 270^0 + i\sin 270^0\right)$

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155. Change the following complex numbers to Cartesiasn form: $4\left(\cos 300^0 + i\sin 300^0\right)$

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156. Write the number $z = \left(i - \sqrt{3}\right)^{13}$ in algebraic form.

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157. Write the following complex numbers in the polar form: $1 + i$

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158. Put the following numbers in the polar form: $-1 - \sqrt{3}i$

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159. Write the following complex numbers in the polar form: $1 - i$

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160. Put the following numbers in the polar form: -3

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161. Convert of the complex number in the polar form: $1 + i$

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162. Write the following complex numbers in the polar form: $-1 - i$

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163. Convert of the complex number in the polar form: $\sqrt{} + i$

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164. Put the following numbers in the polar form: $-4 + i4\sqrt{3}$

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165. Convert of the complex number in the polar form: i

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

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

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168. Find the modulus and argument of the following complex number and hence express each of them in the polar form: $\frac{-16}{1+i\sqrt{3}}$

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169. Write down the following complex number in polar form: $Productof 2\left(\cos 30^0 + i\sin 30^0\right)$ and $3\left(\cos 90^0 + i\sin 90^0\right)$

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170. Give the following products in polar form:

$[3(\cos 225^0 + i\sin 225^0)][6(\cos 45^0 + i\sin 45^0)]$

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171. Give the following products in polar form:

$[2(\cos 210^0 + i\sin 210^0)][4(\cos 120^0 + i\sin 120^0)]$

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172. Convert it into a+ib form:

$$\frac{7(\cos 135^\circ + i\sin 135^\circ)}{14(\cos 90^\circ + i\sin 90^\circ)}.$$

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173. Give the following quotients in polar form: $\frac{9(\cos 90^0 + i\sin 90^0)}{3(\cos 45^0 + i\sin 45^0)}$

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

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175. If $\frac{a+ib}{c+id} = x + iy$, prove that(i) $\frac{a-ib}{c-id} = (x - iy)$ (ii) $\frac{a^2+b^2}{c^2+d^2} = (x^2 + y^2)$

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176. If $\frac{a+ib}{c+id} = x + iy$, prove that(i) $\frac{a-ib}{c-id} = (x - iy)$ (ii) $\frac{a^2+b^2}{c^2+d^2} = (x^2 + y^2)$

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177. Show that a real value of x will satisfy the equation $\frac{1-ix}{1+ix} = a - ib$ if $a^2 + b^2 = 1$, when a, b are real.

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

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179. If $(a + ib)(c + id)(e + if)(g + ih) = A$, then show that $(a^2 + b^2)(c^2 + d^2)(e^2 + f^2)(g^2 + h^2) = A^2 + B^2$

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

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181. If $\frac{1}{m+in}-\frac{x-iy}{x+iy}=0, where x, y, m, n$ are real and $x+iy \neq 0$ and $m+in \neq 0$, prove that $m^2+n^2=1$.

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182. if $\left(1+i\frac{x}{a}\right)\left(1+i\frac{x}{b}\right)\left(1+i\frac{x}{c}\right)\ldots=A+iB$ then prove that $\left(1+\frac{x^2}{a^2}\right)\left(1+\frac{x^2}{b^2}\right)\left(1+\frac{x^2}{c^2}\right)\ldots=A^2+B^2$

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183. If $\frac{a-ib}{a+ib}=\frac{1+i}{1-i}$, then show that $a+b=0$

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184. Express $\left(1+a^2\right)\left(1+b^2\right)$ as the sum of two squares.

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185. Express $\left(x^2+a^2\right)\left(x^2+b^2\right)\left(x^2+c^2\right)$ as the sum of two squares

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186. Show that $\left(x^2+y^2\right)^4=\left(x^4-6x^2y^2+y^4\right)^2+\left(4x^3y-4xy^3\right)^2$.

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187. Plot the following numbers nd their complex conjugates on a complex number plane $4-3i$

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188. Plot the following numbers nd their complex conjugates on a complex number plane : 1

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189. Represent the following complex numbers in the complex plane

i

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190. Plot the following numbers nd their complex conjugates on a complex number plane $-\frac{4}{3}i$

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191. Plot the following numbers and their complex conjugates on a complex number plane : $\sqrt{-3}$

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192. Plot the following numbers nd their complex conjugates on a complex number plane : $\frac{\sqrt{3}}{2}+\frac{i}{2}$

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193. Plot all the complex numbers in the complex number plane whose asbsolute value is 5.

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194. Show that the points representing the complex numbers $3+4i, 8-6i$ and $13+9i$ are the vertices of a right angled triangle.

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195. Prove that the points representing the complex numbers $4+3i, 6+4i, 5+6i, 3+5i$ are the vertices of a square.

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196. Prove that the points $(4,\ 5),\ (7,\ 6),\ (6,\ 3),\ (3,\ 2)$ are the vertices of a parallelogram. Is it a rectangle.

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197. A variable complex number $z = x + iy$ is such that $\arg \frac{z-1}{z+1} = \frac{\pi}{2}$. Show that $x^2 + y^2 - 1 = 0$.

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198. Prove that locus of z is a circle and find its centre and radius if $\frac{z-i}{z-1}$ is purely imaginary.

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199. If the points $(2,\ 1)$ and $(1,\ -2)$ are equidistant from the point $(x,\ y)$, show that $x + 3y = 0$.

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