B.Sc. I, B-126 Algebra & Trigonometry

Topic - Trigonometry

Q.1 Find the value of A & B, if $A+iB = \frac{3-2i}{7+4i}$

Q2. Show that $\sinh(x+y)\cosh(x-y) = \frac{1}{2}(\sinh 2x + \sinh 2y)$.

Q3. Resolve $\sin^2(x+iy)$ in to real and imaginary parts.

Q4. If $\tan(\theta+i\phi) = \tan\alpha + i\sec\alpha$, then prove that

$$e^{2\phi} = \pm\cot\tfrac{1}{2}\alpha \text{ and } 2\theta = n\pi + \tfrac{\pi}{2} + \alpha.$$

Q5. If $A+iB = c\tan(x+iy)$, then prove that

$$\tan 2x = \frac{2cA}{c^2 - A^2 - B^2}$$

Q6 Prove that $\log\tan\left(\frac{\pi}{4} + i\frac{\alpha}{2}\right) = i\tan^{-1}(\sinh\alpha)$

Q7 Show that $\tan\left(i\log\frac{a-ib}{a+ib}\right) = \frac{2ab}{a^2-b^2}$

Q8 Prove that $i^i = e^{-(4n+1)\pi/2}$

Q9. If $(a+ib)^p = m^{x+iy}$, then prove that

$$\frac{y}{x} = \frac{2\tan^{-1}(b/a)}{\log(a^2+b^2)}.$$

Q.10 Prove that $\frac{\pi}{8} = \frac{1}{1\cdot3} + \frac{1}{5\cdot7} + \frac{1}{9\cdot11} + \ldots$ ad. inf.

Q.11 Show that $\left[\frac{1}{2}+\frac{1}{5}+\frac{1}{8}\right] - \frac{1}{3}\left[\frac{1}{2^3}+\frac{1}{5^3}+\frac{1}{8^3}\right] + \frac{1}{5}\left[\frac{1}{2^5}+\frac{1}{5^5}+\frac{1}{8^5}\right] \ldots = \frac{\pi}{4}$

Q.12 Sum the series $1 + e^{\cos\alpha}\cos(\sin\alpha) + \frac{1}{2!}e^{2\cos\alpha}\cos(2\sin\alpha) + \ldots$ ad inf

Q.13 Sum the series

$$\cos\alpha - \frac{\cos(\alpha+2\beta)}{3!} + \frac{\cos(\alpha+4\beta)}{5!} + \ldots \text{ ad. inf.}$$

Q.14 Sum the series

$$\tan^{-1}\left(\frac{1}{1+1+1^2}\right) + \tan^{-1}\left(\frac{1}{1+2+2^2}\right) + \tan^{-1}\left(\frac{1}{1+3+3^2}\right) + \ldots \text{ to n terms}$$

Q15. Find the sum of the series

$$\sin\alpha - \frac{\sin 3\alpha}{2!} + \frac{\sin 5\alpha}{4!} + \ldots \text{ ad inf.}$$

Q.16 State and prove Gregory's series.

Q17 Sum the series.

$$1 + c\cosh\theta + c^2\cosh 2\theta + c^3\cosh 3\theta + \ldots \text{ to n terms.}$$

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