Worked example

The convergent infinite series C and S are defined as

$$C = 1 + \frac{1}{5}\cos\theta + \frac{1}{25}\cos 2\theta + \frac{1}{125}\cos 3\theta + \cdots$$

$$S = \frac{1}{5}\sin\theta + \frac{1}{25}\sin 2\theta + \frac{1}{125}\sin 3\theta + \cdots$$

a) Find an expression for $C + iS$

b) Hence find an expression for C and S

Your turn

The convergent infinite series C and S are defined as

$$C = 1 + \frac{1}{3}\cos\theta + \frac{1}{9}\cos 2\theta + \frac{1}{27}\cos 3\theta + \cdots$$

$$S = \frac{1}{3}\sin\theta + \frac{1}{9}\sin 2\theta + \frac{1}{27}\sin 3\theta + \cdots$$

a) Find an expression for $C + iS$

b) Hence find an expression for C and S

a) $C + iS = \frac{3}{3 - e^{i\theta}}$

b) $C = \frac{9 - 3\cos\theta}{10 - 6\cos\theta}$

$S = \frac{3\sin\theta}{10 - 6\cos\theta}$

Worked example	Your turn
The convergent infinite series C and S are defined as $$C = 1 - \frac{1}{3}\cos\theta + \frac{1}{9}\cos 2\theta - \frac{1}{27}\cos 3\theta + \cdots$$ $$S = \frac{1}{3}\sin\theta - \frac{1}{9}\sin 2\theta + \frac{1}{27}\sin 3\theta + \cdots$$ By considering $C - iS$, show that $C = \frac{9+3\cos\theta}{10+6\cos\theta}$ and write down the corresponding expression for S	The convergent infinite series C and S are defined as $$C = 1 - \frac{1}{2}\cos\theta + \frac{1}{4}\cos 2\theta - \frac{1}{8}\cos 3\theta + \cdots$$ $$S = \frac{1}{2}\sin\theta - \frac{1}{4}\sin 2\theta + \frac{1}{8}\sin 3\theta + \cdots$$ By considering $C - iS$, show that $C = \frac{4+2\cos\theta}{5+4\cos\theta}$ and write down the corresponding expression for S Shown $$S = \frac{2\sin\theta}{5 + 4\cos\theta}$$