

1E Part 2 Infinite Summations

1. $S = 1 + \frac{1}{2}e^{i\theta} + \frac{1}{4}e^{2i\theta} + \frac{1}{8}e^{3i\theta} + \dots$

a) Show that

$$S = \frac{4 - 2 \cos \theta + 2i \sin \theta}{5 - 4 \cos \theta}$$

Let: $P = 1 + \frac{1}{2}\cos\theta + \frac{1}{4}\cos2\theta + \frac{1}{8}\cos3\theta + \dots$ and $Q = \frac{1}{2}\sin\theta + \frac{1}{4}\sin2\theta + \frac{1}{8}\sin3\theta + \dots$

b) Show that $S = P + Qi$

c) Hence, find trigonometric expressions for P and Q