A#19 SMALL ANGLE APPROXIMATIONS

AEM questions are taken from past exam papers - they have been carefully chosen to represent a typical exam question at each level of difficulty. If you can do these questions, you’re ready to move onto past papers for this topic.

APPRENTICE

For the small angle $\theta$, show that

$$\frac{\cos \theta - 1}{\tan 2\theta} \approx -\frac{\theta}{4}$$

EXPERT

a. For the small angle $\theta$, show that the expression

$$\frac{4 \cos 3\theta - 2 + 5 \sin \theta}{1 - \sin 2\theta}$$

can be written as $9\theta + 2$.

b. Hence, state the value of

$$\frac{4 \cos 3\theta - 2 + 5 \sin \theta}{1 - \sin 2\theta}$$

when $\theta$ is small.

MASTER

a. For the small angle $\theta$, show that the equation

$$32 \cos(5\theta) + 203 \tan(10\theta) = 182$$

can be written

$$40\theta^2 - 203\theta + 15 = 0.$$ 

b. Hence, find approximate solutions to the equation

$$32 \cos(5\theta) + 203 \tan(10\theta) = 182$$

and comment on the validity of these solutions.