

5. Given that θ is small and in radians, use the small angle approximations to find an approximate value of

$$\frac{\cos 9\theta - 1}{\theta \sin \theta}$$

(3)

Small Angle Approximations From Formula Book:

$$\sin \theta \approx \theta$$

$$\cos \theta \approx 1 - \frac{\theta^2}{2}$$

$$\tan \theta \approx \theta$$

So,

$$\frac{\cos 9\theta - 1}{\theta \sin \theta} \approx \frac{1 - \frac{(9\theta)^2}{2} - 1}{\theta \times \theta} \quad (2 \text{ marks})$$

$$\approx \frac{-81\theta^2}{2\theta^2}$$

$$\approx -\frac{81}{2} \quad (1 \text{ mark})$$