



Air maths tuition

Interact, engage and perform

Applying small angle approximations for $\sin(x)$, $\cos(x)$ and $\tan(x)$

① $\lim_{\theta \rightarrow 0} \left(\frac{\cos 3\theta - 1}{\theta \sin 5\theta} \right) \approx \frac{1 - \frac{(3\theta)^2}{2} - 1}{\theta(5\theta)}$

$\approx -\frac{9\theta^2}{5\theta^2}$

$\approx -\frac{9}{5}$

② $\lim_{\theta \rightarrow 0} \left(\frac{\sin 2\theta + \tan 4\theta}{3\theta} \right) \approx \frac{2\theta + 4\theta}{3\theta}$

$\approx \frac{6\theta}{3\theta}$

≈ 2

③ $\lim_{x \rightarrow 0} \left(\frac{3\tan x - x}{\sin 2x} \right) \approx \frac{3x - x}{2x}$

≈ 1

④ $\lim_{x \rightarrow 0} \left(\frac{x^2 + \sin 4x}{2x - \sin x} \right) \approx \frac{x^2 + 4x}{2x - x}$

$\approx \frac{x(x+4)}{x}$

$\approx x + 4$

≈ 4 for small x

for small θ , measured in radians
 $\sin \theta \approx \theta$
 $\tan \theta \approx \theta$
 $\cos \theta \approx 1 - \frac{\theta^2}{2}$

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