

Trigonometry & Differentiation

What you are given and what you need to know in C3

FORMULAE FOR EDEXCEL

2013/14

Trigonometry & Differentiation

What you are given and what you need to know in C3

Exact Values of trigonometric functions

x° (deg)	x° (rad)	sin	cos	tan
0	0	0	1	0
30	$\frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$
45	$\frac{\pi}{4}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{2}}$	1
60	$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$
90	$\frac{\pi}{2}$	1	0	-
180	π	0	-1	0

Rules and facts

- $\sin^2 x + \cos^2 x = 1$
- $\tan x = \frac{\sin x}{\cos x}$
- $\operatorname{cosec} x = \frac{1}{\sin x}$
- $\sec x = \frac{1}{\cos x}$
- $\cot x = \frac{1}{\tan x} = \frac{\cos x}{\sin x}$

Applying these rules

Dividing (1) by $\sin^2 x$ will give you: $1 + \cot^2 x = \operatorname{cosec}^2 x$

Dividing (1) by $\cos^2 x$ will give you: $\tan^2 x + 1 = \sec^2 x$

(*) means the rule is given in the Edexcel Formula book

Addition Formulae*

$$1. \sin(A+B) = \sin A \cos B + \cos A \sin B$$

$$2. \sin(A-B) = \sin A \cos B - \cos A \sin B$$

$$3. \cos(A+B) = \cos A \cos B - \sin A \sin B$$

$$4. \cos(A-B) = \cos A \cos B + \sin A \sin B$$

$$5. \tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$6. \tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

Finding the Double Angle Formulae, by applying these rules

Substituting in A for B in (1) will give you:

$$\sin 2A = 2 \sin A \cos A$$

Substituting in A for B in (3) will give you:

$$\cos 2A = \cos^2 A - \sin^2 A$$

If you then substitute in $\sin^2 x = 1 - \cos^2 x$, you get:

$$\cos 2A = 2 \cos^2 A - 1$$

Alternatively, if you substitute in $\cos^2 x = 1 - \sin^2 x$, you get:

$$\cos 2A = 1 - 2 \sin^2 A$$

Substituting in A for B in (5) will give you:

$$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$$

(*) means the rule is given in the Edexcel Formula book

R addition Formulae

If you are given the form $a\cos\theta + b\sin\theta$: use $R\cos(\theta - \alpha)$

If you are given the form $a\sin\theta + b\cos\theta$: use $R\sin(\theta + \alpha)$

Where a,b & R are positive and α is acute

Factor Formulae*

$$\sin A + \sin B = 2\sin\left(\frac{A+B}{2}\right)\cos\left(\frac{A-B}{2}\right)$$

$$\sin A - \sin B = 2\cos\left(\frac{A+B}{2}\right)\sin\left(\frac{A-B}{2}\right)$$

$$\cos A + \cos B = 2\cos\left(\frac{A+B}{2}\right)\cos\left(\frac{A-B}{2}\right)$$

$$\cos A - \cos B = -2\sin\left(\frac{A+B}{2}\right)\sin\left(\frac{A-B}{2}\right)$$

Differentiation

Chain rule

If $y = f(u)$ and $u = g(x)$, then:

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

Product rule

If $y = u(x)v(x)$, where u and v are functions of x then:

$$\frac{dy}{dx} = u \times \frac{dv}{dx} + v \times \frac{du}{dx}$$

Quotient rule*

If $y = \frac{u(x)}{v(x)}$, where u and v are functions of x then:

$$\frac{dy}{dx} = \frac{v \times \frac{du}{dx} - u \times \frac{dv}{dx}}{v^2}$$

Exponential Functions

If $y = e^{f(x)}$, then

$$\frac{dy}{dx} = f'(x)e^{f(x)}$$

Functions of $\ln(x)$

If $y = \ln [f(x)]$, then

$$\frac{dy}{dx} = \frac{f'(x)}{f(x)}$$

(* means the rule is given in the Edexcel Formula book

Function in terms of y

$$\text{If } x=f(y), \text{ then } \frac{dy}{dx} = \frac{1}{\frac{dx}{dy}}$$

Trigonometric differentiation

$y=f(x)$	$\frac{dy}{dx}$	In formula book
Sin x	Cos x	
Cos x	-Sin x	
Tan (kx)	$k \sec^2(kx)$	*
Cosec x	$-\text{cosec } x \cot x$	*
Sec x	Sec x tan x	*
Cot x	$-\text{cosec}^2x$	*