Trigonometry & Differentiation

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

FORMULAE FOR EDEXCEL

2013/14

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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

1. $\text{Sin}^2 x + \cos^2 x = 1$
2. $\text{Tan } x = \frac{\sin x}{\cos x}$
3. $\text{Cosec } x = \frac{1}{\sin x}$
4. $\text{Sec } x = \frac{1}{\cos x}$
5. $\text{Cot } x = \frac{1}{\tan x} = \frac{\cos x}{\sin x}$

Applying these rules

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

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 $\mathbf{\sin^2 x = 1 - \cos^2 x}$, you get: $\cos 2A = 2\cos^2 A - 1$

Alternatively, if you substitute in $\mathbf{\cos^2 x = 1 - \sin^2 x}$, 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 n 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*

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

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

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

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

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

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 n the Edexcel Formula book

Function in terms of y

If x=f(y), 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	-cosec x cot x	*
Sec x	Sec x tan x	*
Cot x	$-\text{cosec}^2$x	*

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