MATH TECH TUTORIALS
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ALGEBRIC FORMULAE

1) $(a+b)^2 = a^2 + b^2 + 2ab$

2) $(a-b)^2 = a^2 + b^2 - 2ab$

3) $a^2 - b^2 = (a+b)(a-b)$

4) $(a+b)^3 = a^3 + b^3 + 3a^2b + 3ab^2$

5) $(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$

6) $(a^3+b^3) = (a+b)(a^2 - ab + b^2)$

7) $(a^3 - b^3) = (a-b)(a^2 + ab + b^2)$

8) $a^n = a.a.a.....n$ times where $n \varepsilon N$

9) $a^m.a^n = a^{m+n}$ where $m,n \varepsilon Q$, $a \varepsilon R$

10) $\frac{a^m}{a^n} = a^{m-n}$ if $m>n$ = 1 if $m=n$

11) $(a^m)^n = (a^n)^m = a^{mn}$

12) $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$ where a b, $n \varepsilon R$, $b \neq 0$

13) $a^0 = 1$ where $a \varepsilon R$, $a \neq 0$

14) $a^{-n} = \frac{1}{a^n}$ & $\frac{1}{a^{-n}} = a^n$ where $a \varepsilon R$, $a \neq 0$

15) $ax^2 + bx + c = a(x-\alpha)(x-\beta)$

15a) where $\alpha = \frac{-b+\sqrt{b^2-4ac}}{2a}$ & $\beta = \frac{-b-\sqrt{b^2-4ac}}{2a}$

16) $\sum_{r=1}^{n} r = 1+2+3.....n = \frac{n}{2}(n+1)$

17) $\sum_{r=1}^{n} r^2$ $1^2+2^2+3^2.....n^2 = \frac{n}{6}(n+1)(2n+1)$

18) $\sum_{r=1}^{n} r^3$ $1^3+2^3+3^3.....n^3 = \frac{n^2}{4}(n+1)^2$

19) $x^n - a^n = (x-a)(x^{n-1} + x^{n-2}a + x^{n-3}a^2 + x^{n-4}a^3 + ... + a^{n-1})$ where n is a odd No.

20) $x^n + a^n = (x+a)(x^{n-1} - x^{n-2}a + x^{n-3}a^2 - x^{n-4}a^3 + ... + a^{n-1})$ where n is a odd No.

21) $(a+b)^n = a^n + c_1^n a^{n-1}b + c_2^n a^{n-2}b^2 + c_3^n a^{n-3}b^3 + ... + c_r^n a^{n-r}b^n + ... + b^n$ where $c_r^n = \frac{n!}{r!(n-r)!}$

FORMULA REGARDING LOGARITHMIC FUNCATION

i) If $a^x = N$ $\therefore x = \log_a N$ where $a \neq 1$

ii) $\log_m \frac{a}{b} = \log_m a - \log_m b$

iii) $\log_a a = 1$

iv) $\log a^m = m \log a$

v) $\log_b a = \frac{\log_e a}{\log_e b}$ (change of base)

vi) $\log_m ab = \log_m a + \log_m b$

vii) $\log_{10} 10 = 1$

viii) $\log_a 1 = 0$

ix) $e^{\log a} = a$

x) $\log_a x^2 = 2 \log_a x$

xi) $\log_b a \times \log_a b = 1$

xii) $-\log_a b = \frac{1}{\log_a b}$

TRIGNOMETRY FORMULA

1) $\sin\theta \cdot \operatorname{cosec}\theta = 1$

2) $\sin C + \sin D = 2\sin\left(\frac{C+D}{2}\right) . \cos\left(\frac{C-D}{2}\right)$

3) $\sin\theta = \frac{1}{\operatorname{cosec}\theta}$

4) $\sin C - \sin D = 2\cos\left(\frac{C+D}{2}\right) . \sin\left(\frac{C-D}{2}\right)$

5) $\operatorname{cosec}\theta = \frac{1}{\sin\theta}$

6) $\cos C + \cos D = 2\cos\left(\frac{C+D}{2}\right) . \cos\left(\frac{C-D}{2}\right)$

7) $\cos\theta \cdot \sec\theta = 1$

8) $\cos C - \cos D = 2\sin\left(\frac{C+D}{2}\right) . \sin\left(\frac{C-D}{2}\right)$

9) $\sec\theta = \frac{1}{\cos\theta}$

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

11) $\cos\theta = \frac{1}{\sec\theta}$

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

13) $\tan\theta \cdot \cot\theta = 1$

14) $\tan\left(\frac{\pi}{4} + A\right) = \frac{1 + \tan A}{1 - \tan A}$

15) $\tan\theta = \frac{\sin\theta}{\cos\theta}$

16) $\tan\left(\frac{\pi}{4} - A\right) = \frac{1-\tan A}{1+\tan A}$

17) $\tan\theta = \frac{1}{\cot\theta}$

18) $\cos 3A = 4\cos^3 - 3\cos A$

19) $\cot\theta = \frac{\cos\theta}{\sin\theta}$

20) $\tan^{-1}A + \tan^{-1}B = \tan^{-1}\left(\frac{A+B}{1-AB}\right)$

21) $\cot\theta = \frac{1}{\tan\theta}$

22) $\tan^{-1}A - \tan^{-1}B = \tan^{-1}\left(\frac{A-B}{1+AB}\right)$

23) $\sin^2 A + \cos^2 A = 1$

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

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

24) $\sin 3A = 3\sin A - 4\sin^3$

25) $1 + \tan^2 A = \sec^2 A$

a) $1 = \sec^2 A - \tan^2 A$

b) $\tan^2 A = \sec^2 A - 1$

26) $\tan 3A = \frac{3\tan A - \tan^3 A}{1 - 3\tan^2 A}$

27) $2\sin A.\sin B = \cos(A-B) - \cos(A+B)$

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

$= 2\cos^2 A - 1$

$= 1 - 2\sin^2 A$

29) $1 + \cot^2 A = \operatorname{cosec}^2 A$

a) $\cot^2 A = \operatorname{cosec}^2 A - 1$

b) $1 = \operatorname{cosec}^2 A - \cot^2 A$

30) $\cos A = \cos^2 A/2 - \sin^2 A/2$

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

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

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

33) $\cos A = \frac{1-\tan^2 A/2}{1+\tan^2 A/2}$

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

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

36) $1 - \sin A = (\cos A/2 - \sin A/2)^2$

37) $\sin 2A = 2\sin A . \cos A$

38) $1 - \sin 2A = (\cos A - \sin A)^2$

39) $\sin A = 2\sin A/2 . \cos A/2$

41) $1 + \sin 2A = (\cos A + \sin A)^2$

40) $1 + \cos 2A = 2\cos^2 A$

42) $1 + \sin A = (\cos A/2 + \sin A/2)^2$

43) $1 + \cos A = 2\cos^2 A/2$

44) $1 - \cos 2A = 2\sin^2 A$

45) $1 - \cos A = 2\sin^2 A/2$

46) $\text{Tan}2A = \frac{2\tan A}{1-\tan^2 A}$

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

(48) i) $\sin(-\theta) = -\sin\theta$ ii) $\cos(-\theta) = \cos\theta$ iii) $\tan(-\theta) = -\tan\theta$

(49) i) $\sin\left(\frac{\pi}{2} - \theta\right) = \cos\theta$ ii) $\cos\theta\left(\frac{\pi}{2} - \theta\right) = \sin\theta$ iii) $\tan\theta\left(\frac{\pi}{2} - \theta\right) = \cot\theta$

iv) $\sec\theta\left(\frac{\pi}{2} - \theta\right) = \text{cosec}\theta$ v) $\text{cosec}\theta\left(\frac{\pi}{2} - \theta\right) = \sec\theta$ vi) $\cot\theta\left(\frac{\pi}{2} - \theta\right) = \tan\theta$

(43) Half angle formula:

i) $\sin\theta = 2\sin\frac{\theta}{2} . \cos\frac{\theta}{2}$ ii) $\cos\theta = \cos^2\frac{\theta}{2} - \sin^2\frac{\theta}{2} = \frac{1-\tan\frac{2\theta}{2}}{1+\tan\frac{2\theta}{2}}$ iii) $\tan\theta = \frac{2\tan\frac{\theta}{2}}{1-\tan^2\frac{\theta}{2}}$

$\sin\theta = \frac{2\tan\frac{\theta}{2}}{1+\tan^2\frac{\theta}{2}}$ $\cos\theta = 1-2\sin^2\frac{\theta}{2}$ => $1 - \cos\theta = 2\sin^2\frac{\theta}{2}$

$\cos\theta = 2\cos^2\theta - 1$ => $1 + \cos 2\theta = 2\cos^2\theta$

(44) Double angle formula:

i) $\sin 2\theta = 2\sin\theta . \cos\theta$ ii) $\cos 2\theta = \cos^2\theta - \sin^2\theta$ iii) $\tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta}$

$= \frac{2\tan\theta}{1+\tan^2\theta}$ $= 1-2\sin^2$ => $1 - \cos 2\theta = 2\sin^2\theta$

$= \frac{1-\tan^2\theta}{1+\tan^2\theta}$

(45)Triple angle formula:

i) $\sin 3\theta = 3\sin\theta - 4\sin^3\theta$ ii) $\cos 3\theta = 4\cos^3\theta - 3\cos\theta$ iii) $\tan 3\theta = \frac{3\tan\theta - \tan^3\theta}{1-3\tan^2\theta}$

(46) i) $1 \pm \sin 2\theta\ (\cos\theta \pm \sin\theta)^2$ ii) $1 \pm \sin\theta = \left(\cos\frac{\theta}{2} \pm \sin\frac{\theta}{2}\right)^2$

iii) $\tan\left(\frac{\pi}{4} - \theta\right) = \frac{1-\tan\theta}{1+\tan\theta}$ iv) $\tan\left(\frac{\pi}{4} + \theta\right) = \frac{1+\tan\theta}{1-\tan\theta}$

(47) Compound Angle Formula:

i) $\sin(A \pm B) = \sin A.\cos B \pm \cos A.\sin B$ ii) $\cos(A - B) = \cos A.\cos B + \sin A.\sin B$ iii) $\tan(A - B) = \frac{\tan A - \tan B}{1+\tan A.\tan B}$

) $\cos(A + B) = \cos A.\cos B - \sin A.\sin B$ iii) $\tan(A + B) = \frac{\tan A + \tan B}{1-\tan A.\tan B}$

(48) i) $\sin C + \sin D = 2\sin\left(\frac{C+D}{2}\right) . \cos\left(\frac{C-D}{2}\right)$

ii) $\sin C - \sin D = 2\sin\left(\frac{C-D}{2}\right) . \cos\left(\frac{C+D}{2}\right)$

iii) $\cos C + \cos D = 2\cos\left(\frac{C+D}{2}\right) . \cos\left(\frac{C-D}{2}\right)$

iv) $\cos C - \cos D = 2\sin\left(\frac{C+D}{2}\right) . \sin\left(\frac{D-C}{2}\right)$

v) $\tan C + \tan D = \tan(C + D)[1 - \tan C . \tan D]$

vi) $\tan C - \tan D = \tan(C - D)[1 + \tan C . \tan D]$

(49) Defactorization Formula:

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

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

iii) $2\cos A.\cos B = \cos (A+B) + \cos (A-B)$

(50) Add co/cut Co Rule:

i) If n is odd: trigonometric function $\left(n\frac{\pi}{2} + \theta\right)$ = add co/cut co trigonometric function θ.

ii) If n Is Even: trigonometric function $\left(n\frac{\pi}{2} + \theta\right)$ = trigonometric function θ.

: sign as per the quadrant in which $\left(n\frac{\pi}{2} + \theta\right)$ lies & it is as per the original trigonometric function.

LIMITS OF FUNCTION

Limit of a function is written as $\lim\limits_{x\to a}$

i) $\lim\limits_{x\to 0} \frac{\sin x}{x} = 1$

ii) $\lim\limits_{x\to 0} \frac{\sin nx}{x} = n$

iii) $\lim\limits_{x\to 0} \frac{\tan x}{x} = 1$

iv) $\lim\limits_{x\to 0} \frac{\tan ax}{bx} = \frac{a}{b}$

v) $\lim\limits_{x\to 0} \frac{x^n - a^n}{x-a} = na^{n-1} (a > 0)$

vi) $\lim\limits_{x\to 0} \frac{a^x - 1}{x} = \text{looga}$

vii) $\lim\limits_{x\to 0} \frac{\log(1+x)}{x} = 1$

viii) $\lim\limits_{x\to 0} (1 + x)^{1/x} = e$

ix) $\lim\limits_{x\to 0} \frac{e^x - 1}{x} = \log_e e = 1$

FORMULA REGARDING DERIVATIVES

(1) Algebraic:

i) $\frac{d}{dx}(x^n) = nx^{n-1}$

ii) $\frac{d}{dx}\left(\frac{1}{x^n}\right) = \frac{-n}{x^{n+1}}$

iii) $\frac{d}{dx}(k) = 0$

iv) $\frac{d}{dx}\left(\sqrt{x}\right) = \frac{1}{2\sqrt{x}}$

v) $\frac{d}{dx}\left(\frac{k}{x}\right) = \frac{-k}{x^2}$

(2) Trigonometry:

i) $\frac{d}{dx}(\sin x) = \cos x$

ii) $\frac{d}{dx}(\cos x) = -\sin x$

iii) $\frac{d}{dx}(\sec x) = \sec x . \tan x$

iv) $\frac{d}{dx}(\text{cosec} x) = -\text{cosec} x . \cot x$

v) $\frac{d}{dx}(\tan x) = \sec^2 x$

vi) $\frac{d}{dx}(\cot x) = -\text{cosec}^2 x$

(3) Inverse:

i) $\sin^{-1}x = \frac{1}{\sqrt{1-x^2}}$ ii) $\frac{d}{dx}\cos^{-1}x = \frac{-1}{\sqrt{1-x^2}}$ iii) $\frac{d}{dx}\sec^{-1}x = \frac{1}{x\sqrt{x^2-1}}$

iv) $\frac{d}{dx}\text{cosec}^{-1}x = \frac{-1}{x\sqrt{x^2-1}}$ v) $\frac{d}{dx}\tan^{-1}x = \frac{1}{1+x^2}$ vi) $\frac{d}{dx}\cot^{-1}x = \frac{-1}{1+x^2}$

(4) Exponential:

i) $\frac{d}{dx}(e^x) = e^x$ ii) $\frac{d}{dx}(a^x) = a^x \log a$ iii) $\frac{d}{dx}(\log x) = \frac{1}{x}$ iv) $\frac{d}{dx}\log_a x = \frac{1}{x\log a}$

(5) Rules:

i) Additional rule: $\frac{d}{dx}(u + v) = \frac{du}{dx} + \frac{dv}{dx}$

ii) Subtraction Rule: $\frac{d}{dx}(u - v) = \frac{du}{dx} - \frac{dv}{dx}$

iii) Product Rule: $\frac{d}{dx}(uv) = u\frac{dv}{dx} + v\frac{du}{dx}$

iv) Quotient Rule: $\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$

v) Chain Rule: $\frac{dy}{dx} = \frac{dy}{du}.\frac{du}{dv}.\frac{dv}{dx}$

vi) Parametric Rule: $\frac{dy}{dx} = \frac{\frac{dy}{du}}{\frac{dx}{du}}$

FORMULAE REGARDING INTEGRATION

(1) ALGEBRAIC:

i) $\int x^n dx = \frac{x^{n+1}}{n+1} + c$ ii) $\int k\, dx = kx + c$

(2) TRIGONOMETRIC:

i) $\int \sin x\, dx = -\cos x + c$ ii) $\int \cos x\, dx = \sin x + c$ iii) $\int \sec x\, dx = \log|\sec x + \tan x| + c$

iv) $\int \text{cosec}\, x\, dx = \log|\text{cosec}\, x - \cot x| + c$ OR $\log\left|\tan\frac{x}{2}\right| + c$ v) $\int \tan x\, dx = \log|\sec x| + c$

vi) $\int \cot x\, dx = \log|\sin x| + c$ vii) $\int \sec x.\tan x\, dx = \sec x + c$ viii) $\int \text{cosec}\, x.\cot x\, dx = -\text{cosec}\, x + c$

ix) $\int \sec^2 x\, dx = \tan x + c$ x) $\int \text{cosec}^2 x\, dx = -\cot x + c$ xi) $\int \sec x\, dx = \log\left|\tan\left(\frac{\pi}{4} + \frac{x}{2}\right)\right| + c$

(3) INVERSE:

i) $\int \frac{1}{\sqrt{1+x^2}} = \sin^{-1}x + c$ ii) $\int \frac{1}{1+x^2} = \tan^{-1}x + c$ iii) $\int \frac{1}{x\sqrt{x^2-1}} = \sec^{-1} + c$

iv) $\int \frac{1}{x^2+a^2}dx = \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right) + c$ v) $\int \frac{1}{x^2-a^2}dx = \frac{1}{2a}\log\left|\frac{x-a}{x+a}\right| + c$ vi) $\int \frac{1}{a^2-x^2}dx = \frac{1}{2a}\log\left|\frac{a+x}{a-x}\right| + c$

vii) $\int \frac{1}{\sqrt{x^2+a^2}}dx = \log\left|x + \sqrt{x^2+a^2}\right| + c$ viii) $\int \frac{1}{\sqrt{a^2-x^2}}dx = \sin^{-1}\left(\frac{x}{a}\right) + c$

ix) $\int \frac{1}{\sqrt{x^2-a^2}} dx = \log\left|x + \sqrt{x^2 - a^2}\right| + c$

(4) EXPONENTIAL:

i) $\int e^x dx = e^x + c$ ii) $\int a^x dx = \frac{a^x}{\log a} + c$ iii) $\int a^x \log a = a^x + c$

(5) LOGARITHMIC:

i) $\int \log e^x = x\log x - x = x(\log x - 1)$ ii) $\int \log a^x = \frac{1}{\log a}(x\log x - x)$ iii) $\int \frac{1}{x} dx = \log|x| + c$

iv) $\int \frac{1}{x \log a} dx = \log_a x + c$ v) $\int \frac{f'(x)}{f(x)} dx = \log|f(x)| + c$ vi) $\int e^x[f(x) + f'(x)]dx = e^x f(x) + c$

vii) $\int \sqrt{x^2 + a^2} dx = \frac{x}{2}\sqrt{x^2 + a^2} + \frac{a^2}{2}\log\left|x + \sqrt{x^2 + a^2}\right| + c$

viii) $\int \sqrt{x^2 - a^2} = \frac{x}{2}\sqrt{x^2 - a^2} - \frac{a^2}{2}\log\left|x\sqrt{x^2 - a^2}\right| + c$

ix) $\int \sqrt{a^2 - x^2} dx = \frac{x}{2}\sqrt{a^2 - x^2} + \frac{a^2}{2}\sin^{-1}\left(\frac{x}{a}\right) + c$

INVERSE FUNCTION

1) $\sin^{-1}(\sin x) = x = \sin(\sin^{-1}x)$ 2) $\cos^{-1}(\cos x) = x = \cos(\cos^{-1}x)$ 3) $\tan^{-1}(\tan x) = x = \tan(\tan^{-1}x)$

4) $\cot^{-1}(\cot x) = x = \cot(\cot^{-1}x)$ 5) $\sec^{-1}(\sec x) = x = \sec(\sec^{-1}x)$ 6) $\text{cosec}^{-1}(\text{cosec } x) = x = \text{cosec}(\text{cosec}^{-1}x)$

7) $\sin^{-1}\left(\frac{1}{x}\right) = \text{cosec}^{-1} x$ 8) $\cos^{-1}\left(\frac{1}{x}\right) = \sec^{-1} x$ 9) $\text{cosec}^{-1}\left(\frac{1}{x}\right) = \sin^{-1} x$

10) $\sec^{-1}\left(\frac{1}{x}\right) = \cos^{-1} x$ 11) $\tan^{-1}\left(\frac{1}{x}\right) = \cot^{-1} x$ 12) $\cot^{-1}\left(\frac{1}{x}\right) = \tan^{-1} x$

13) $\sin^{-1}x + \cos^{-1}x = \frac{\pi}{2}$ 14) $\tan^{-1}x + \cot^{-1}x = \frac{\pi}{2}$ 15) $\sec^{-1}x + \text{cosec}^{-1}x = \frac{\pi}{2}$

16) $\tan^{-1}x + \tan^{-1}y = \tan^{-1}\left(\frac{x+y}{1-xy}\right)$ 17) $\tan^{-1}x - \tan^{-1}y = \tan^{-1}\left(\frac{x-y}{1+xy}\right)$ 18) $2\tan^{-1}x = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$

19) $3\tan^{-1}x = \tan^{-1}\left(\frac{3x-x^3}{1-3x^2}\right)$ 20) $2\sin^{-1}x = \sin^{-1}\left(2x\sqrt{1-x^2}\right)$ 21) $2\cos^{-1}x = \cos^{-1}(2x^2 - 1)$

22) $3\sin^{-1}x = \sin^{-1}(3x - 4x^3)$ 23) $3\cos^{-1}x = \cos^{-1}(4x^3 - 3x)$

FORMULA REGARDING DERIVATIVES	FORMULAE REGARDING INTEGRATION
1) $\frac{d}{dx}(k) = 0$	1) $\int k\,dx = kx + c$
2) $\frac{d}{dx}(x^n) = nx^{n-1}$	2) $\int x^n dx = \frac{x^{n+1}}{n+1} + c$
3) $\frac{d}{dx}\left(\frac{1}{x^n}\right) = \frac{-n}{x^{n+1}}$	3) $\int \frac{n}{x^{n+1}} dx = -\frac{1}{x^n} + c$
4) $\frac{d}{dx}\left(\sqrt{x}\right) = \frac{1}{2\sqrt{x}}$	4) $\int \frac{1}{2\sqrt{x}} dx = \sqrt{x} + c$
5) $\frac{d}{dx}\left(\frac{k}{x}\right) = \frac{-k}{x^2}$	5) $\int \frac{1}{x^2} dx = -\frac{1}{x} + c$
6) $\frac{d}{dx}(\sin x) = \cos x$	6) $\int \sin x\,dx = -\cos x + c$
7) $\frac{d}{dx}(\cos x) = -\sin x$	7) $\int \cos x\,dx = \sin x + c$
8) $\frac{d}{dx}(\tan x) = \sec^2 x$	8) $\int \sec^2 x\,dx = \tan x + c$
9) $\frac{d}{dx}(\cot x) = -\mathrm{cosec}^2 x$	9) $\int \mathrm{cosec}^2 x\,dx = -\cot x + c$
10) $\frac{d}{dx}(\sec x) = \sec x \,.\, \tan x$	10) $\int \sec x.\tan x\,dx = \sec x + c$
11) $\frac{d}{dx}(\mathrm{cosec}\,x) = -\mathrm{cosec}\,x \,.\, \cot x$	11) $\int \mathrm{cosec}\,x.\cot x\,dx = -\mathrm{cosec}\,x + c$
12) $\frac{d}{dx}\sin^{-1}x = \frac{1}{\sqrt{1-x^2}}$	12) $\int \frac{1}{\sqrt{1+x^2}} dx = \sin^{-1}x + c$
13) $\frac{d}{dx}\cos^{-1}x = \frac{-1}{\sqrt{1-x^2}}$	13) $\int \frac{1}{\sqrt{1+x^2}} dx = -\cos^{-1}x + c$
14) $\frac{d}{dx}\tan^{-1}x = \frac{1}{1+x^2}$	14) $\int \frac{1}{1+x^2} dx = \tan^{-1}x + c$
15) $\frac{d}{dx}\cot^{-1}x = \frac{-1}{1+x^2}$	15) $\int \frac{1}{1+x^2} dx = -\cot^{-1}x + c$
16) $\frac{d}{dx}\sec^{-1}x = \frac{1}{x\sqrt{x^2-1}}$	16) $\int \frac{1}{x\sqrt{x^2-1}} dx = \sec^{-1}x + c$
17) $\frac{d}{dx}\mathrm{cosec}^{-1}x = \frac{-1}{x\sqrt{x^2-1}}$	17) $\int \frac{1}{x\sqrt{x^2-1}} dx = -\mathrm{cosec}^{-1}x + c$
18) $\frac{d}{dx}(e^x) = e^x$	18) $\int e^x dx = e^x + c$
19) $\frac{d}{dx}(a^x) = a^x \log a$	19) $\int a^x \log a\,dx = a^x + c$
20) $\frac{d}{dx}(\log x) = \frac{1}{x}$	20) $\int \frac{1}{x} dx = \log x + c$
21) $\frac{d}{dx}\log_a x = \frac{1}{x \log a}$	21) $\int a^x dx = \frac{a^x}{\log a} + c$