Laws of Indices

1) $A^x \times A^y = A^{x+y}$	2) $\frac{A^x}{A^y} = A^{x-y}$
3) $(A^x)^y = A^{x \times y}$	4) $(A \times B)^x = A^x \times B^x$
5) $\left(\frac{A}{B}\right)^x = \frac{A^x}{B^x}$	6) $\frac{1}{A^x} = A^{-x}$ **or** $\frac{1}{A^{-x}} = A^x$
7) $\sqrt{x}.\sqrt{y} = \sqrt{x \times y}$	8) $\sqrt{\frac{x}{y}} = \frac{\sqrt{x}}{\sqrt{y}}$
9) $A^{\frac{1}{x}} = \sqrt[x]{A}$	10) $A^0 = 1$
11) $A^1 = A$	

Rules of Logarithm

12) $\log_e e = \log e = 1$	13) $\log_a a = 1$
14) $\log_a 1 = \log_e 1 = \log 1 = 0$	15) $\log a + \log b = \log(a \times b)$
16) $\log a - \log b = \log\left(\frac{a}{b}\right)$	17) $\log(x)^y = y \log x$
18) $\log\left(\frac{a}{b}\right) = -\log\left(\frac{b}{a}\right)$	19) $\log\left(\frac{1}{a}\right) = -\log(a)$
20) $\log_b a = \frac{\log a}{\log b}$	21) $e^{\log x} = e^{\log_e x} = x$
22) $a^{\log_a x} = x$	

Fundamental Identity

23) $\sin^2\theta + \cos^2\theta = 1$	24) $\sec^2\theta - \tan^2\theta = 1$
25) $\operatorname{cosec}^2\theta - \cot^2\theta = 1$	

Factorisation Formulae

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

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

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

Expansion Formulae

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

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

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

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

Straight Line

33) Equation of line in standard form $ax + by + c = 0$

and slope of above line is $= m = \dfrac{-\text{coefficient of } x}{\text{coefficient of } y} = \dfrac{-a}{b}$

34) The slope of a line passing through the point (x_1, y_1)

and (x_2, y_2) is $= m = \dfrac{y_2 - y_1}{x_2 - x_1}$

35) The slope of a line whose inclination θ is $= m = \tan\theta$

36) **Slope – Point Form :** The equation of line having slope m and passing through the point (x_1, y_1) is $\mathbf{y - y_1 = m(x - x_1)}$

37) **Two – Point Form :** The equation of line passing through the point (x_1, y_1) and (x_2, y_2) is $\dfrac{y - y_1}{y_1 - y_2} = \dfrac{x - x_1}{x_1 - x_2}$

38) **Two – Intercept Form :** The equation of line having x – intercept is a and y – intercept is b is $\dfrac{x}{a} + \dfrac{y}{b} = 1$

39) Two lines L_1 & L_2 are said to be **parallel** if their slopes are equal i.e. $\mathbf{m_1 = m_2}$

Straight Line

40) Two lines L_1 & L_2 are said to be **perpendicular** if $\mathbf{m_1 . m_2 = -1}$

41) **Mid – Point Form :** Let $A = (x_1, y_1)$ and $B = (x_2, y_2)$ be two given points then the mid – point AB is $= \left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}\right)$

42) **Angle Between Two Lines :** Let m_1 be the slope of line L_1 and m_2 be the slope of L_2 then angle between two lines L_1 and L_2 is $\tan\theta = \left|\dfrac{m_1 - m_2}{1 + m_1 . m_2}\right|$

43) **Perpendicular Distance Between Point and Line :**

The perpendicular distance from a point $P(x_1, y_1)$ to the line $ax + by + c = 0$ is $\tan\theta = \left|\dfrac{m_1 - m_2}{1 + m_1 . m_2}\right|$

44) **Perpendicular Distance Between Two Parallel Lines :**

The perpendicular distance two parallel lines $ax + by + c_1 = 0$ and $ax + by + c_2 = 0$ is $= \left|\dfrac{c_1 - c_2}{\sqrt{a^2 + b^2}}\right|$

Statistics

45) Range = Largest Value − Smallest Value = L − S

46) Coefficient of Range $= \dfrac{\text{Range}}{\text{Sum of Largest and Smallest value}}$

$$= \frac{L-S}{L+S}$$

47)	For Raw data	For Ungroup data	For Group data
Mean	$= \dfrac{\sum x_i}{N}$	$= \dfrac{\sum f_i \cdot x_i}{\sum f_i}$	$= \dfrac{\sum f_i \cdot x_i}{\sum f_i}$
Mean Deviation from Mean	$= \dfrac{\sum \lvert d_i \rvert}{N}$	$= \dfrac{\sum f_i \cdot \lvert d_i \rvert}{\sum f_i}$	$= \dfrac{\sum f_i \cdot \lvert d_i \rvert}{\sum f_i}$
Standard Deviation (S.D.= σ)	$= \sqrt{\dfrac{\sum d_i^2}{N}}$	$= \sqrt{\dfrac{\sum f_i \cdot d_i^2}{\sum f_i}}$	$= \sqrt{\dfrac{\sum f_i \cdot d_i^2}{\sum f_i}}$

Since $d_i = x_i - \bar{x}$ and $\bar{x}$ = mean = M

48) Variance = (Standard deviation)^2 = $(\sigma)^2$

49) Coefficient of Variance = C.V. = $\dfrac{\sigma}{\bar{x}} \times 100$

Trigonometry

50) $\sin\theta = \dfrac{1}{\operatorname{cosec}\theta}$ **or** $\operatorname{cosec}\theta = \dfrac{1}{\sin\theta}$ **or** $\sin\theta \cdot \operatorname{cosec}\theta = 1$

51) $\cos\theta = \dfrac{1}{\sec\theta}$ **or** $\sec\theta = \dfrac{1}{\cos\theta}$ **or** $\cos\theta \cdot \sec\theta = 1$

52) $\tan\theta = \dfrac{1}{\cot\theta}$ **or** $\cot\theta = \dfrac{1}{\tan\theta}$ **or** $\tan\theta \cdot \cot\theta = 1$

53) $\tan\theta = \dfrac{\sin\theta}{\cos\theta}$

54) $\cot\theta = \dfrac{\cos\theta}{\sin\theta}$

55)

In IInd Quadrant $\sin\theta$ & $\operatorname{cosec}\theta$ are + ve and remaining all ratio's are − ve	**In Ist Quadrant** All ratio's are + ve
In IIIrd Quadrant $\tan\theta$ & $\cot\theta$ are + ve and remaining all ratio's are − ve	**In IVth Quadrant** $\cos\theta$ & $\sec\theta$ are + ve and remaining all ratio's are − ve

Trigonometric Ratio's of Negative Angle

56) $\sin(-\theta) = -\sin\theta$	57) $\cos(-\theta) = \cos\theta$
58) $\tan(-\theta) = -\tan\theta$	59) $\cot(-\theta) = -\cot\theta$
60) $\sec(-\theta) = \sec\theta$	61) $\operatorname{cosec}(-\theta) = -\operatorname{cosec}\theta$

Angles → / Ratios ↓	0^0	$30^0 = \frac{\pi}{6}$	$45^0 = \frac{\pi}{4}$	$60^0 = \frac{\pi}{3}$	$90^0 = \frac{\pi}{2}$
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	∞
cot	∞	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0
sec	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	∞
cosec	∞	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1

63) $\cos n\pi = (-1)^n \quad , \quad n = 0, 1, 2, 3, 4 \ldots$

64) $\sin n\pi = 0 \quad , \quad n = 0, 1, 2, 3, 4 \ldots$

$n \times \frac{\pi}{2}$ = Ratio Change if n is odd i.e. $n = 1, 3, 5, 7, \ldots$

$n \times \frac{\pi}{2}$ = Ratio Not Change if n is even i.e. $n = 2, 4, 6, 8, \ldots$

Ratio Change means :

sin → cos	cos → sin
tan → cot	cot → tan
sec → cosec	cosec → sec

* Trigonometric Ratio's of $\left(\frac{\pi}{2}-\theta\right)$ (is lies in Ist quadrant)

66) $\sin\left(\frac{\pi}{2}-\theta\right) = \sin\left(1\times\frac{\pi}{2}-\theta\right) = \cos\theta$

67) $\cos\left(\frac{\pi}{2}-\theta\right) = \cos\left(1\times\frac{\pi}{2}-\theta\right) = \sin\theta$

68) $\tan\left(\frac{\pi}{2}-\theta\right) = \tan\left(1\times\frac{\pi}{2}-\theta\right) = \cot\theta$

69) $\cot\left(\frac{\pi}{2}-\theta\right) = \cot\left(1\times\frac{\pi}{2}-\theta\right) = \tan\theta$

70) $\sec\left(\frac{\pi}{2}-\theta\right) = \sec\left(1\times\frac{\pi}{2}-\theta\right) = \operatorname{cosec}\theta$

71) $\operatorname{cosec}\left(\frac{\pi}{2}-\theta\right) = \operatorname{cosec}\left(1\times\frac{\pi}{2}-\theta\right) = \sec\theta$

* Trigonometric Ratio's of $\left(\frac{\pi}{2}+\theta\right)$ (is lies in IInd quadrant)

72) $\sin\left(\frac{\pi}{2}+\theta\right) = \sin\left(1\times\frac{\pi}{2}+\theta\right) = \cos\theta$

73) $\cos\left(\frac{\pi}{2}+\theta\right) = \cos\left(1\times\frac{\pi}{2}+\theta\right) = -\sin\theta$

74) $\tan\left(\frac{\pi}{2}+\theta\right) = \tan\left(1\times\frac{\pi}{2}+\theta\right) = -\cot\theta$

75) $\cot\left(\frac{\pi}{2}+\theta\right) = \cot\left(1\times\frac{\pi}{2}+\theta\right) = -\tan\theta$

76) $\sec\left(\frac{\pi}{2}+\theta\right) = \sec\left(1\times\frac{\pi}{2}+\theta\right) = -\operatorname{cosec}\theta$

77) $\operatorname{cosec}\left(\frac{\pi}{2}+\theta\right) = \operatorname{cosec}\left(1\times\frac{\pi}{2}+\theta\right) = \sec\theta$

* Trigonometric Ratio's of $(\pi-\theta)$ (is lies in IInd quadrant)

78) $\sin(\pi-\theta) = \sin\left(2\times\frac{\pi}{2}-\theta\right) = \sin\theta$

79) $\cos(\pi-\theta) = \cos\left(2\times\frac{\pi}{2}-\theta\right) = -\cos\theta$

80) $\tan(\pi-\theta) = \tan\left(2\times\frac{\pi}{2}-\theta\right) = -\tan\theta$

81) $\cot(\pi-\theta) = \cot\left(2\times\frac{\pi}{2}-\theta\right) = -\cot\theta$

82) $\sec(\pi-\theta) = \sec\left(2\times\frac{\pi}{2}-\theta\right) = -\sec\theta$

83) $\operatorname{cosec}(\pi-\theta) = \operatorname{cosec}\left(2\times\frac{\pi}{2}-\theta\right) = \operatorname{cosec}\theta$

* **Trigonometric Ratio's of** $(\pi+\theta)$ (is lies in III^rd^ quadrant)

84) $\sin(\pi+\theta) = \sin\left(2\times\frac{\pi}{2}+\theta\right) = -\sin\theta$

85) $\cos(\pi+\theta) = \cos\left(2\times\frac{\pi}{2}+\theta\right) = -\cos\theta$

86) $\tan(\pi+\theta) = \tan\left(2\times\frac{\pi}{2}+\theta\right) = \tan\theta$

87) $\cot(\pi+\theta) = \cot\left(2\times\frac{\pi}{2}+\theta\right) = \cot\theta$

88) $\sec(\pi+\theta) = \sec\left(2\times\frac{\pi}{2}+\theta\right) = -\sec\theta$

89) $\operatorname{cosec}(\pi+\theta) = \operatorname{cosec}\left(2\times\frac{\pi}{2}+\theta\right) = -\operatorname{cosec}\theta$

* **Trigonometric Ratio's of** $\left(\frac{3\pi}{2}-\theta\right)$ (is lies in IIIrd quadrant)

90) $\sin\left(\frac{3\pi}{2}-\theta\right) = \sin\left(3\times\frac{\pi}{2}-\theta\right) = -\cos\theta$

91) $\cos\left(\frac{3\pi}{2}-\theta\right) = \cos\left(3\times\frac{\pi}{2}-\theta\right) = -\sin\theta$

92) $\tan\left(\frac{3\pi}{2}-\theta\right) = \tan\left(3\times\frac{\pi}{2}-\theta\right) = \cot\theta$

93) $\cot\left(\frac{3\pi}{2}-\theta\right) = \cot\left(3\times\frac{\pi}{2}-\theta\right) = \tan\theta$

94) $\sec\left(\frac{3\pi}{2}-\theta\right) = \sec\left(3\times\frac{\pi}{2}-\theta\right) = -\operatorname{cosec}\theta$

95) $\operatorname{cosec}\left(\frac{3\pi}{2}-\theta\right) = \operatorname{cosec}\left(3\times\frac{\pi}{2}-\theta\right) = -\sec\theta$

* **Trigonometric Ratio's of** $\left(\frac{3\pi}{2}+\theta\right)$ (is lies in IVth quadrant)

96) $\sin\left(\frac{3\pi}{2}+\theta\right) = \sin\left(3\times\frac{\pi}{2}+\theta\right) = -\cos\theta$

97) $\cos\left(\frac{3\pi}{2}+\theta\right) = \cos\left(3\times\frac{\pi}{2}+\theta\right) = \sin\theta$

98) $\tan\left(\frac{3\pi}{2}+\theta\right) = \tan\left(3\times\frac{\pi}{2}+\theta\right) = -\cot\theta$

99) $\cot\left(\frac{3\pi}{2}+\theta\right) = \cot\left(3\times\frac{\pi}{2}+\theta\right) = -\tan\theta$

100) $\sec\left(\frac{3\pi}{2}+\theta\right) = \sec\left(3\times\frac{\pi}{2}+\theta\right) = \operatorname{cosec}\theta$

101) $\operatorname{cosec}\left(\frac{3\pi}{2}+\theta\right) = \operatorname{cosec}\left(3\times\frac{\pi}{2}+\theta\right) = -\sec\theta$

* Trigonometric Ratio's of $(2\pi - \theta)$ (is lies in IVth quadrant)

102) $\sin(2\pi - \theta) = \sin\left(4\times\frac{\pi}{2} - \theta\right) = -\sin\theta$

103) $\cos(2\pi - \theta) = \cos\left(4\times\frac{\pi}{2} - \theta\right) = \cos\theta$

104) $\tan(2\pi - \theta) = \tan\left(4\times\frac{\pi}{2} - \theta\right) = -\tan\theta$

105) $\cot(2\pi - \theta) = \cot\left(4\times\frac{\pi}{2} - \theta\right) = -\cot\theta$

106) $\sec(2\pi - \theta) = \sec\left(4\times\frac{\pi}{2} - \theta\right) = \sec\theta$

107) $\operatorname{cosec}(2\pi - \theta) = \operatorname{cosec}\left(4\times\frac{\pi}{2} - \theta\right) = -\operatorname{cosec}\theta$

* Trigonometric Ratio's of $(2\pi + \theta)$ (is lies in Ist quadrant)

108) $\sin(2\pi + \theta) = \sin\left(4\times\frac{\pi}{2} + \theta\right) = \sin\theta$

109) $\cos(2\pi + \theta) = \cos\left(4\times\frac{\pi}{2} + \theta\right) = \cos\theta$

110) $\tan(2\pi + \theta) = \tan\left(4\times\frac{\pi}{2} + \theta\right) = \tan\theta$

111) $\cot(2\pi + \theta) = \cot\left(4\times\frac{\pi}{2} + \theta\right) = \cot\theta$

112) $\sec(2\pi + \theta) = \sec\left(4\times\frac{\pi}{2} + \theta\right) = \sec\theta$

113) $\operatorname{cosec}(2\pi + \theta) = \operatorname{cosec}\left(4\times\frac{\pi}{2} + \theta\right) = \operatorname{cosec}\theta$

114) $\sin(A + B) = \sin A \,.\, \cos B + \cos A \,.\, \sin B$

115) $\sin(A - B) = \sin A \,.\, \cos B - \cos A \,.\, \sin B$

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

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

118) $\tan(A + B) = \dfrac{\tan A + \tan B}{1 - \tan A \,.\, \tan B}$

119) $\tan(A - B) = \dfrac{\tan A - \tan B}{1 + \tan A \,.\, \tan B}$

Multiple Angle Formulae	Sub – Multiple Angle Formulae
120) $\sin 2A = 2\sin A \cdot \cos A$	121) $\sin A = 2\sin\left(\frac{A}{2}\right).\cos\left(\frac{A}{2}\right)$
122) $\sin 2A = \frac{2\tan A}{1+\tan^2 A}$	123) $\sin A = \frac{2\tan\left(\frac{A}{2}\right)}{1+\tan^2\left(\frac{A}{2}\right)}$
124) $\cos 2A = \cos^2 A - \sin^2 A$	125) $\cos A = \cos^2\left(\frac{A}{2}\right)-\sin^2\left(\frac{A}{2}\right)$
126) $\cos 2A = 2\cos^2 A - 1$	127) $\cos A = 2\cos^2\left(\frac{A}{2}\right)-1$
128) $\cos 2A = 1 - 2\sin^2 A$	129) $\cos A = 1-2\sin^2\left(\frac{A}{2}\right)$
130) $1+\cos 2A = 2\cos^2 A$	131) $1+\cos A = 2\cos^2\left(\frac{A}{2}\right)$
132) $1-\cos 2A = 2\sin^2 A$	133) $1-\cos A = 2\sin^2\left(\frac{A}{2}\right)$
134) $\cos 2A = \frac{1-\tan^2 A}{1+\tan^2 A}$	135) $\cos A = \frac{1-\tan^2\left(\frac{A}{2}\right)}{1+\tan^2\left(\frac{A}{2}\right)}$

Multiple Angle Formulae	Sub – Multiple Angle Formulae
136) $\tan 2A = \frac{2\tan A}{1-\tan^2 A}$	137) $\tan A = \frac{2\tan\left(\frac{A}{2}\right)}{1-\tan^2\left(\frac{A}{2}\right)}$
138) $\sin 3A = 3\sin A - 4\sin^3 A$	
139) $\cos 3A = 4\cos^3 A - 3\cos A$	
140) $\tan 3A = \frac{3\tan A - \tan^3 A}{1-3\tan^2 A}$	

141) $\sin(A+B) + \sin(A-B) = 2\sin A \cdot \cos B$

142) $\sin(A+B) - \sin(A-B) = 2\cos A \cdot \sin B$

143) $\cos(A+B) + \cos(A-B) = 2\cos A \cdot \cos B$

144) $\cos(A+B) - \cos(A-B) = -2\sin A \cdot \sin B$

or

145) $\cos(A-B) - \cos(A+B) = 2\sin A \cdot \sin B$

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

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

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

149) $\cos C - \cos D = -2\sin\left(\frac{C+D}{2}\right) \cdot \sin\left(\frac{C-D}{2}\right)$ if $C > D$

or

150) $\cos C - \cos D = 2\sin\left(\frac{C+D}{2}\right) \cdot \sin\left(\frac{D-C}{2}\right)$ if $C < D$

151) $\sin^{-1}(\sin x) = x = \sin(\sin^{-1} x)$

152) $\cos^{-1}(\cos x) = x = \cos(\cos^{-1} x)$

153) $\tan^{-1}(\tan x) = x = \tan(\tan^{-1} x)$

154) $\cot^{-1}(\cot x) = x = \cot(\cot^{-1} x)$

155) $\sec^{-1}(\sec x) = x = \sec(\sec^{-1} x)$

156) $\operatorname{cosec}^{-1}(\operatorname{cosec} x) = x = \operatorname{cosec}(\operatorname{cosec}^{-1} x)$

157) $\sin^{-1} x = \operatorname{cosec}^{-1}\left(\frac{1}{x}\right)$

158) $\cos^{-1} x = \sec^{-1}\left(\frac{1}{x}\right)$

159) $\tan^{-1} x = \cot^{-1}\left(\frac{1}{x}\right)$

160) $\cot^{-1} x = \tan^{-1}\left(\frac{1}{x}\right)$

161) $\sec^{-1} x = \cos^{-1}\left(\frac{1}{x}\right)$

162) $\operatorname{cosec}^{-1} x = \sin^{-1}\left(\frac{1}{x}\right)$

163) $\sin^{-1}(-x) = -\sin^{-1}x$

164) $\cos^{-1}(-x) = \pi - \cos^{-1}x$

165) $\tan^{-1}(-x) = -\tan^{-1}x$

166) $\cot^{-1}(-x) = -\cot^{-1}x$

167) $\sec^{-1}(-x) = \pi - \sec^{-1}x$

168) $\operatorname{cosec}^{-1}(-x) = -\operatorname{cosec}^{-1}x$

169) $\tan^{-1} x + \tan^{-1} y = \tan^{-1}\left(\frac{x+y}{1-xy}\right)$ if $x>0,\ y>0,\ xy<1$

170) $\tan^{-1} x + \tan^{-1} y = \pi + \tan^{-1}\left(\frac{x+y}{1-xy}\right)$ if $x>0,\ y>0,\ xy>1$

171) $\tan^{-1} x - \tan^{-1} y = \tan^{-1}\left(\frac{x-y}{1+xy}\right)$

Formula of Derivative

172) $\frac{d}{dx}(K) = 0$, K is any constant

173) $\frac{d}{dx}(x) = 1$

174) $\frac{d}{dx}\left(x^2\right) = 2x$ $\therefore$ $\frac{d}{dx}\left[f(x)^2\right] = 2\,f(x) \times \frac{d}{dx}[f(x)]$ where $f(x)$ is any function of x

175) $\frac{d}{dx}\left(x^3\right) = 3x^2$ $\therefore$ $\frac{d}{dx}\left[f(x)^3\right] = 3\left[f(x)\right]^2 \times \frac{d}{dx}[f(x)]$ where $f(x)$ is any function of x

176) $\frac{d}{dx}\left(x^n\right) = nx^{n-1}$ $\therefore$ $\frac{d}{dx}\left[f(x)^n\right] = n\left[f(x)\right]^{n-1} \times \frac{d}{dx}[f(x)]$ where $f(x)$ is any function of x

177) $\frac{d}{dx}\left(e^x\right) = e^x$ $\therefore$ $\frac{d}{dx}\left[e^{f(x)}\right] = e^{f(x)} \times \frac{d}{dx}[f(x)]$ where $f(x)$ is any function of x

178) $\frac{d}{dx}\left(a^x\right) = a^x . \log a$ $\therefore$ $\frac{d}{dx}\left[a^{f(x)}\right] = a^{f(x)} . \log a \times \frac{d}{dx}[f(x)]$ where $f(x)$ is any function of x

179) $\frac{d}{dx}(\log x) = \frac{1}{x}$ $\therefore$ $\frac{d}{dx}\left[\log\left(f(x)\right)\right] = \frac{1}{f(x)} \times \frac{d}{dx}[f(x)]$ where $f(x)$ is any function of x

180) $\frac{d}{dx}\left(\frac{1}{x}\right) = \frac{-1}{x^2}$ $\therefore$ $\frac{d}{dx}\left[\frac{1}{f(x)}\right] = \frac{-1}{\left[f(x)\right]^2} \times \frac{d}{dx}[f(x)]$ where $f(x)$ is any function of x

181) $\frac{d}{dx}\left(\sqrt{x}\right) = \frac{1}{2\sqrt{x}}$	$\therefore \frac{d}{dx}\left[\sqrt{f(x)}\right] = \frac{1}{2\sqrt{f(x)}} \times \frac{d}{dx}[f(x)]$	where $f(x)$ is any function of x
182) $\frac{d}{dx}(\sin x) = \cos x$	$\therefore \frac{d}{dx}[\sin(f(x))] = \cos(f(x)) \times \frac{d}{dx}[f(x)]$	where $f(x)$ is any function of x
183) $\frac{d}{dx}(\cos x) = -\sin x$	$\therefore \frac{d}{dx}[\cos(f(x))] = -\sin(f(x)) \times \frac{d}{dx}[f(x)]$	where $f(x)$ is any function of x
184) $\frac{d}{dx}(\tan x) = \sec^2 x$	$\therefore \frac{d}{dx}[\tan(f(x))] = \sec^2(f(x)) \times \frac{d}{dx}[f(x)]$	where $f(x)$ is any function of x
185) $\frac{d}{dx}(\cot x) = -\mathrm{cosec}^2 x$	$\therefore \frac{d}{dx}[\cot(f(x))] = -\mathrm{cosec}^2(f(x)) \times \frac{d}{dx}[f(x)]$	where $f(x)$ is any function of x
186) $\frac{d}{dx}(\sec x) = \sec x . \tan x$	$\therefore \frac{d}{dx}[\sec(f(x))] = \sec(f(x)).\tan(f(x)) \times \frac{d}{dx}[f(x)]$	where $f(x)$ is any function of x
187) $\frac{d}{dx}(\mathrm{cosec} x) = -\mathrm{cosec} x . \cot x$	$\therefore \frac{d}{dx}[\mathrm{cosec}(f(x))] = -\mathrm{cosec}(f(x)).\cot(f(x)) \times \frac{d}{dx}[f(x)]$	where $f(x)$ is any function of x
188) $\frac{d}{dx}\left(\sin^{-1}x\right) = \frac{1}{\sqrt{1-x^2}}$	$\therefore \frac{d}{dx}\left[\sin^{-1}(f(x))\right] = \frac{1}{\sqrt{1-[f(x)]^2}} \times \frac{d}{dx}[f(x)]$	where $f(x)$ is any function of x
189) $\frac{d}{dx}\left(\cos^{-1}x\right) = \frac{-1}{\sqrt{1-x^2}}$	$\therefore \frac{d}{dx}\left[\cos^{-1}(f(x))\right] = \frac{-1}{\sqrt{1-[f(x)]^2}} \times \frac{d}{dx}[f(x)]$	where $f(x)$ is any function of x
190) $\frac{d}{dx}\left(\tan^{-1}x\right) = \frac{1}{1+x^2}$	$\therefore \frac{d}{dx}\left[\tan^{-1}(f(x))\right] = \frac{1}{1+[f(x)]^2} \times \frac{d}{dx}[f(x)]$	where $f(x)$ is any function of x

191) $\frac{d}{dx}\left(\cot^{-1}x\right) = \frac{-1}{1+x^2}$	$\therefore$	$\frac{d}{dx}\left[\cot^{-1}(f(x))\right] = \frac{-1}{1+[f(x)]^2} \times \frac{d}{dx}[f(x)]$	where $f(x)$ is any function of x
192) $\frac{d}{dx}\left(\sec^{-1}x\right) = \frac{1}{x\sqrt{x^2-1}}$	$\therefore$	$\frac{d}{dx}\left[\sec^{-1}(f(x))\right] = \frac{1}{f(x)\sqrt{[f(x)]^2-1}} \times \frac{d}{dx}[f(x)]$	where $f(x)$ is any function of x
193) $\frac{d}{dx}\left(\operatorname{cosec}^{-1}x\right) = \frac{-1}{x\sqrt{x^2-1}}$	$\therefore$	$\frac{d}{dx}\left[\operatorname{cosec}^{-1}(f(x))\right] = \frac{-1}{f(x)\sqrt{[f(x)]^2-1}} \times \frac{d}{dx}[f(x)]$	where $f(x)$ is any function of x

If u & v are differentiable function of x then

194) $\frac{d}{dx}(u+v) = \frac{d}{dx}(u) + \frac{d}{dx}(v)$

195) $\frac{d}{dx}(u-v) = \frac{d}{dx}(u) - \frac{d}{dx}(v)$

196) $\frac{d}{dx}(u.v) = u\frac{d}{dx}(v) + v\frac{d}{dx}(u)$

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

Formula of Integration	Note : ** indicates iff f(x) is a linear algebraic function	
198) $\int dx = x + C$		
199) $\int x^n dx = \frac{x^{n+1}}{n+1} + C$	$\therefore \int [f(x)]^n dx = \frac{[f(x)]^{n+1}}{n+1} \times \frac{1}{\frac{d}{dx}[f(x)]} + C$	**
200) $\int e^x dx = e^x + C$	$\therefore \int e^{f(x)} dx = e^{f(x)} \times \frac{1}{\frac{d}{dx}[f(x)]} + C$	**
201) $\int a^x dx = \frac{a^x}{\log a} + C$	$\therefore \int a^{f(x)} dx = \frac{a^{f(x)}}{\log a} \times \frac{1}{\frac{d}{dx}[f(x)]} + C$	**
202) $\int \frac{1}{x} dx = \log x + C$	$\therefore \int \frac{1}{f(x)} dx = \log(f(x)) \times \frac{1}{\frac{d}{dx}[f(x)]} + C$	**
203) $\int \frac{f^1(x)}{f(x)} dx = \log(f(x)) + C$		
204) $\int \frac{1}{\sqrt{x}} dx = 2\sqrt{x} + C$	$\therefore \int \frac{1}{\sqrt{f(x)}} dx = 2\sqrt{f(x)} \times \frac{1}{\frac{d}{dx}[f(x)]} + C$	**
205) $\int \frac{f^1(x)}{\sqrt{f(x)}} dx = 2\sqrt{f(x)} + C$		

206) $\int \sin x \, dx = -\cos x + C$	$\therefore$	$\int \sin[f(x)]dx = -\cos[f(x)] \times \dfrac{1}{\frac{d}{dx}[f(x)]} + C$	* *
207) $\int \cos x \, dx = \sin x + C$	$\therefore$	$\int \cos[f(x)]dx = \sin[f(x)] \times \dfrac{1}{\frac{d}{dx}[f(x)]} + C$	* *
208) $\int \tan x \, dx = \log(\sec x) + C$	$\therefore$	$\int \tan[f(x)]dx = \log(\sec[f(x)]) \times \dfrac{1}{\frac{d}{dx}[f(x)]} + C$	* *
209) $\int \cot x \, dx = \log(\sin x) + C$	$\therefore$	$\int \cot[f(x)]dx = \log(\sin[f(x)]) \times \dfrac{1}{\frac{d}{dx}[f(x)]} + C$	* *
210) $\int \sec x \, dx = \log(\sec x + \tan x) + C$	$\therefore$	$\int \sec[f(x)]dx = \log(\sec[f(x)] + \tan[f(x)]) \times \dfrac{1}{\frac{d}{dx}[f(x)]} + C$	* *
211) $\int \operatorname{cosec} x \, dx = \log(\operatorname{cosec} x - \cot x) + C$	$\therefore$	$\int \operatorname{cosec}[f(x)]dx = \log(\operatorname{cosec}[f(x)] - \cot[f(x)]) \times \dfrac{1}{\frac{d}{dx}[f(x)]} + C$	* *
212) $\int \sec^2 x \, dx = \tan x + C$	$\therefore$	$\int \sec^2[f(x)]dx = \tan[f(x)] \times \dfrac{1}{\frac{d}{dx}[f(x)]} + C$	* *
213) $\int \operatorname{cosec}^2 x \, dx = -\cot x + C$	$\therefore$	$\int \operatorname{cosec}^2[f(x)]dx = -\cot[f(x)] \times \dfrac{1}{\frac{d}{dx}[f(x)]} + C$	* *

214) $\int \sec x \cdot \tan x \, dx = \sec x + C$	$\therefore \int \sec[f(x)] \cdot \tan[f(x)] \, dx = \sec[f(x)] \times \dfrac{1}{\frac{d}{dx}[f(x)]} + C$	* *
215) $\int \operatorname{cosec} x \cdot \cot x \, dx = -\operatorname{cosec} x + C$	$\therefore \int \operatorname{cosec}[f(x)] \cdot \cot[f(x)] \, dx = -\operatorname{cosec}[f(x)] \times \dfrac{1}{\frac{d}{dx}[f(x)]} + C$	* *
216) $\int \dfrac{1}{\sqrt{1-x^2}} \, dx = \sin^{-1} x + C$	$\therefore \int \dfrac{1}{\sqrt{1-[f(x)]^2}} \, dx = \sin^{-1}[f(x)] \times \dfrac{1}{\frac{d}{dx}[f(x)]} + C$	* *
217) $\int \dfrac{1}{\sqrt{1-x^2}} \, dx = -\cos^{-1} x + C$	$\therefore \int \dfrac{1}{\sqrt{1-[f(x)]^2}} \, dx = -\cos^{-1}[f(x)] \times \dfrac{1}{\frac{d}{dx}[f(x)]} + C$	* *
218) $\int \dfrac{1}{1+x^2} \, dx = \tan^{-1} x + C$	$\therefore \int \dfrac{1}{1+[f(x)]^2} \, dx = \tan^{-1}[f(x)] \times \dfrac{1}{\frac{d}{dx}[f(x)]} + C$	* *
219) $\int \dfrac{1}{1+x^2} \, dx = -\cot^{-1} x + C$	$\therefore \int \dfrac{1}{1+[f(x)]^2} \, dx = -\cot^{-1}[f(x)] \times \dfrac{1}{\frac{d}{dx}[f(x)]} + C$	* *
220) $\int \dfrac{1}{x\sqrt{x^2-1}} \, dx = \sec^{-1} x + C$	$\therefore \int \dfrac{1}{f(x)\sqrt{[f(x)]^2-1}} \, dx = \sec^{-1}[f(x)] \times \dfrac{1}{\frac{d}{dx}[f(x)]} + C$	* *
221) $\int \dfrac{1}{x\sqrt{x^2-1}} \, dx = -\operatorname{cosec}^{-1} x + C$	$\therefore \int \dfrac{1}{f(x)\sqrt{[f(x)]^2-1}} \, dx = -\operatorname{cosec}^{-1}[f(x)] \times \dfrac{1}{\frac{d}{dx}[f(x)]} + C$	* *

222) $\int \frac{1}{\sqrt{a^2 - x^2}}\, dx = \sin^{-1}\left(\frac{x}{a}\right) + C$ $\quad \therefore \int \frac{1}{\sqrt{a^2 - [f(x)]^2}}\, dx = \sin^{-1}\left[\frac{f(x)}{a}\right] \times \frac{1}{\frac{d}{dx}[f(x)]} + C$ **

223) $\int \frac{1}{x^2 + a^2}\, dx = \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right) + C$ $\quad \therefore \int \frac{1}{[f(x)]^2 + a^2}\, dx = \frac{1}{a}\tan^{-1}\left[\frac{f(x)}{a}\right] \times \frac{1}{\frac{d}{dx}[f(x)]} + C$ **

224) $\int \frac{1}{x^2 - a^2}\, dx = \frac{1}{2a}\log\left(\frac{x-a}{x+a}\right) + C$ $\quad \therefore \int \frac{1}{[f(x)]^2 - a^2}\, dx = \frac{1}{2a}\log\left[\frac{f(x)-a}{f(x)+a}\right] \times \frac{1}{\frac{d}{dx}[f(x)]} + C$ **

225) $\int \frac{1}{a^2 - x^2}\, dx = \frac{1}{2a}\log\left(\frac{a+x}{a-x}\right) + C$ $\quad \therefore \int \frac{1}{a^2 - [f(x)]^2}\, dx = \frac{1}{2a}\log\left[\frac{a+f(x)}{a-f(x)}\right] \times \frac{1}{\frac{d}{dx}[f(x)]} + C$ **

226) $\int \frac{1}{\sqrt{x^2 + a^2}}\, dx = \log\left(x + \sqrt{x^2 + a^2}\right) + C$ $\quad \therefore \int \frac{1}{\sqrt{[f(x)]^2 + a^2}}\, dx = \log\left[f(x) + \sqrt{[f(x)]^2 + a^2}\right] \times \frac{1}{\frac{d}{dx}[f(x)]} + C$ **

227) $\int \frac{1}{\sqrt{x^2 - a^2}}\, dx = \log\left(x + \sqrt{x^2 - a^2}\right) + C$ $\quad \therefore \int \frac{1}{\sqrt{[f(x)]^2 - a^2}}\, dx = \log\left[f(x) + \sqrt{[f(x)]^2 - a^2}\right] \times \frac{1}{\frac{d}{dx}[f(x)]} + C$ **

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