MOJZA

A Level MATHS FORMULA SHEET
PURE MATHEMATICS 3 (P3)

BY TEAM MOJZA

Algebra

- Binomial Expansion

$(1 + x)^n = 1 + nx + (n(n-1)x^2)/2! + ... + (n(n-1)...(n-r+1)x^r)/r! + ... (|x| < 1, n \in \mathbb{Q})$

- Partial Fractions

- $f(x) / [(x - a)(x - b)] = A / (x - a) + B / (x - b)$
- $f(x) / (x - a)^2 = A / (x - a) + B / (x - a)^2$
- $f(x) / [(x - a)(x^2 - b)] = A / (x - a) + (Bx + C) / (x^2 - b)$

Logarithmic & exponential functions

$\log_a b = (\log_c b / \log_c a)$

Trigonometry

- $\tan(x) \equiv \sin(x) / \cos(x)$
- $\sin^2(x) + \cos^2(x) \equiv 1$
- $1 + \tan^2(x) \equiv \sec^2(x)$
- $\cot^2(x) + 1 \equiv \csc^2(x)$
- $\sin(A \pm B) \equiv \sin(A)\cos(B) \pm \cos(A)\sin(B)$
- $\cos(A \pm B) \equiv \cos(A)\cos(B) \mp \sin(A)\sin(B)$
- $\tan(A \pm B) \equiv (\tan(A) \pm \tan(B)) / (1 \mp \tan(A)\tan(B))$
- $\sin(2A) \equiv 2\sin(A)\cos(A)$
- $\cos(2A) \equiv \cos^2(A) - \sin^2(A) \equiv 2\cos^2(A) - 1 \equiv 1 - 2\sin^2(A)$
- $\tan(2A) \equiv 2\tan(A) / (1 - \tan^2(A))$

Complex Numbers

for $z = a + ib$

$Re(z) = a$

$Im(z) = b$

$\arg(z) = \tan{-1}\, b/a$

$z* = a - ib$

$|z| = \sqrt{(a^2 + b^2)}$

Integration

- f(x)	- ∫ f(x) dx:
• x^n	• $(x^{(n+1)}) / (n + 1)$
• $1/x$	• $\ln x$
• e^x	• e^x
• $\sin(x)$	• $-\cos(x)$
• $\cos(x)$	• $\sin(x)$
• $\sec^2 x$	• $\tan(x)$
$1/(x^2 + a^2)$	• $(1/a) \tan{-1} (x/a)$
• $1/(x^2 - a^2)$	• $(1/2a) \ln \mid (x-a)/(x+a) \mid$
$1/(a^2 - x^2)$	• $(1/2a) \ln \mid (a+x)/(a-x) \mid$

$\int u\, dv(dx)/dx = uv - \int v\, (du/dx)\, (dx)$

$\int (f'(x) / f(x))\, (dx) = \ln |f(x)|$

Vectors

$a.\, b = |a||b| \cos \theta$

Differentiation

- f(x)	- f'(x)
• x^n	• $nx^{(n-1)}$
$\ln(x)$	• $1/x$
• e^x	• e^x
• $\sin(x)$	• $\cos(x)$
• $\cos(x)$	• $-\sin(x)$
• $\tan(x)$	• sec^2(x)
• $\sec(x)$	• $\sec(x)\tan(x)$
• $\csc(x)$	• $-\csc(x)\cot(x)$
• $f(x) = \cot(x)$	• $-\csc^2(x)$
• $f(x) = \tan^{(-1)}(x)$	• $1 / (1 + x^2)$
• $f(x) = uv$	• $v\, (du/dx) + u\, (dv/dx)$
• u/vf	• $(v\, (du/dx) - u\, (dv/dx)) / v^2$

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