Maths Formula Sheet

Chapter by chapter, topic by topic. Written by the PadhoNa team for quick revision.

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CHAPTER 14

Functions

Types of functions

COUNTING

$$|A| = m,\ |B| = n: \quad n^m \text{ functions}; \qquad {}^nP_m \text{ one-one } (n \geq m)$$

ONTO FUNCTIONS

$$\sum_{k=0}^{n} (-1)^k\, {}^nC_k\, (n-k)^m \quad \text{onto maps from } m \text{ to } n \text{ elements}$$

BIJECTION

$$\text{one-one and onto}; \qquad n! \text{ bijections when } |A| = |B| = n$$

Special functions

GREATEST INTEGER

$$[x] \leq x < [x] + 1, \qquad [x+n] = [x] + n\ (n \in \mathbb{Z}), \qquad [x] + [-x] = \begin{cases} 0, & x \in \mathbb{Z} \\ -1, & x \notin \mathbb{Z} \end{cases}$$

FRACTIONAL PART

$$\{x\} = x - [x] \in [0, 1)$$

SIGNUM

$$\operatorname{sgn} x = \frac{|x|}{x}\ (x \neq 0), \qquad \operatorname{sgn} 0 = 0$$

Even, odd and periodic

$$f(-x) = f(x) \text{ even}; \qquad f(-x) = -f(x) \text{ odd}; \qquad f(x) = \underbrace{\frac{f(x)+f(-x)}{2}}_{\text{even}} + \underbrace{\frac{f(x)-f(-x)}{2}}_{\text{odd}}$$

PERIODS

$$\sin x, \cos x:\ 2\pi; \qquad \tan x:\ \pi; \qquad |\sin x|:\ \pi; \qquad \{x\}:\ 1; \qquad f(ax+b):\ \frac{T}{|a|}$$

Composite and inverse

$$(f \circ g)(x) = f(g(x)), \qquad (f \circ g)^{-1} = g^{-1} \circ f^{-1}, \qquad f(f^{-1}(x)) = x$$

f^{-1} exists only if f is a bijection; its graph is the mirror image of f in $y = x$.

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