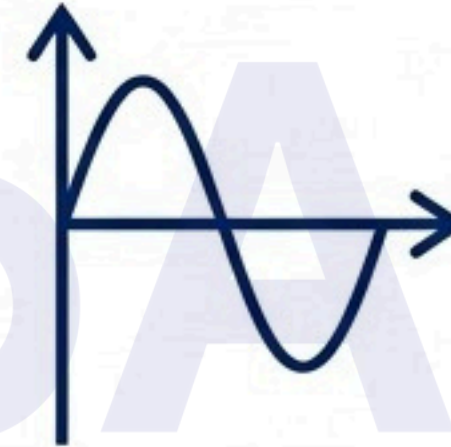


Standard Polynomial and Trigonometric Derivatives

Essential Calculus Toolkit for JEE Mathematics



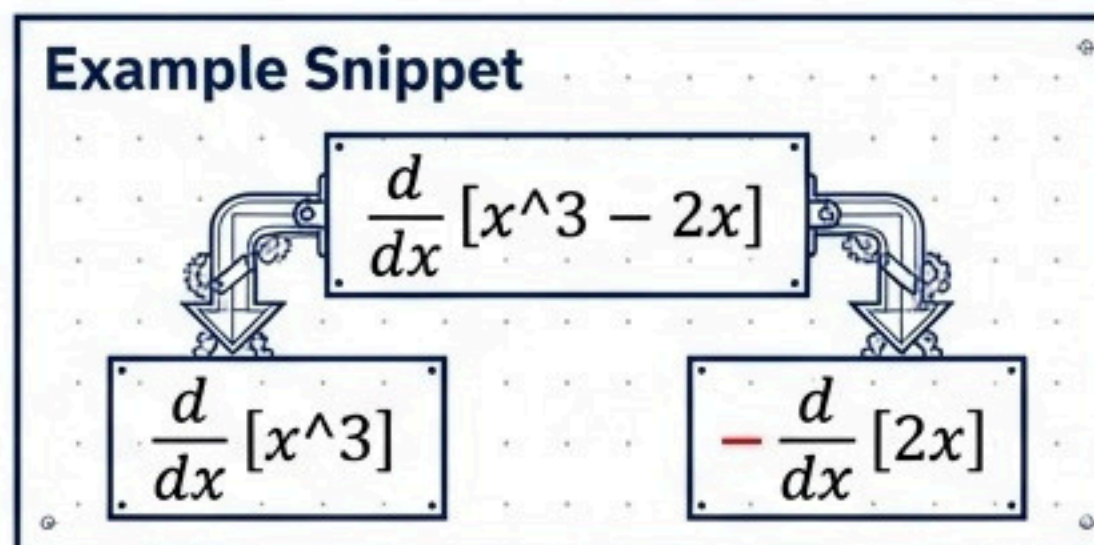
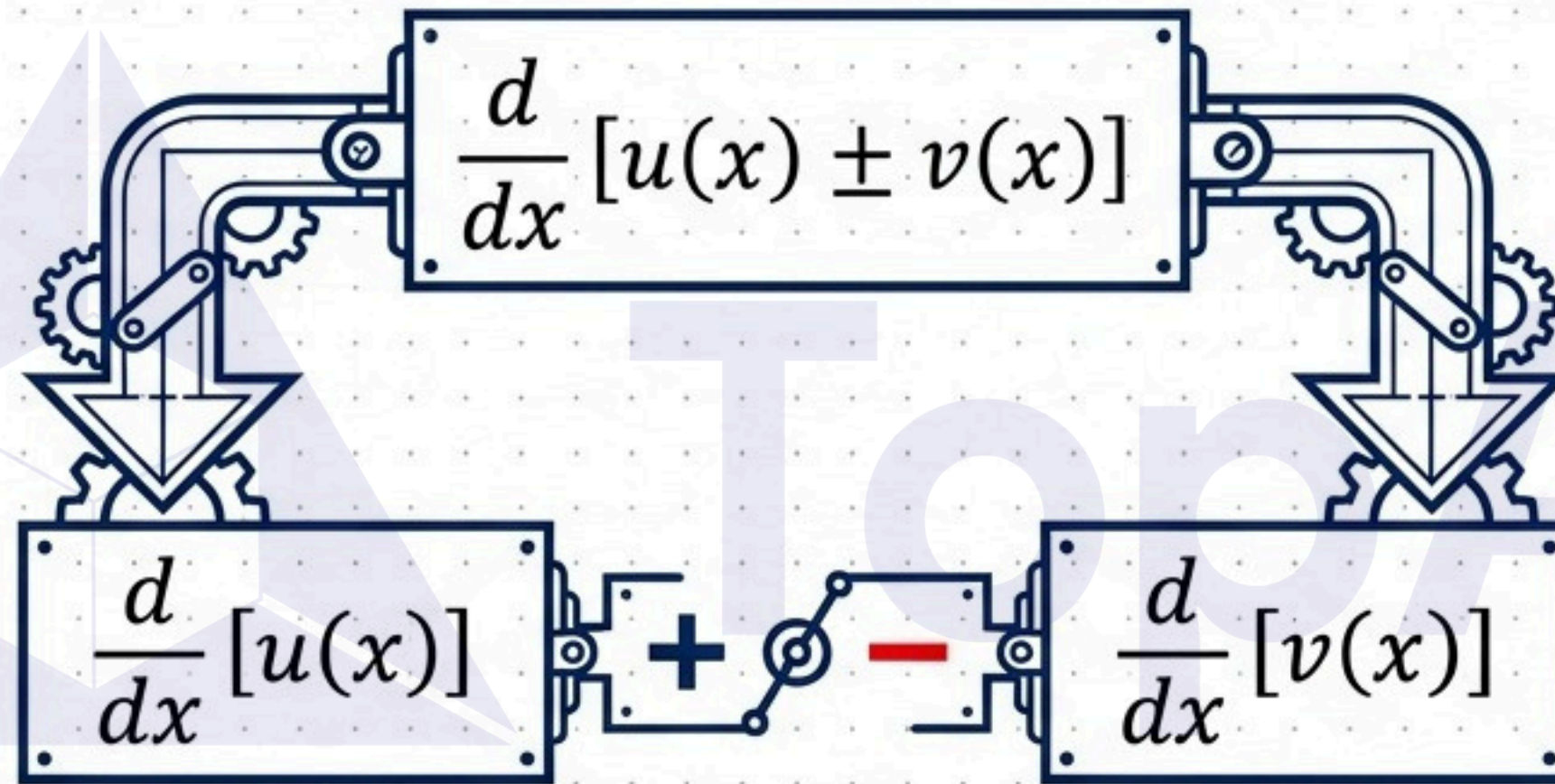
$$[f(x) = a_n x^n + \dots + a_0]$$



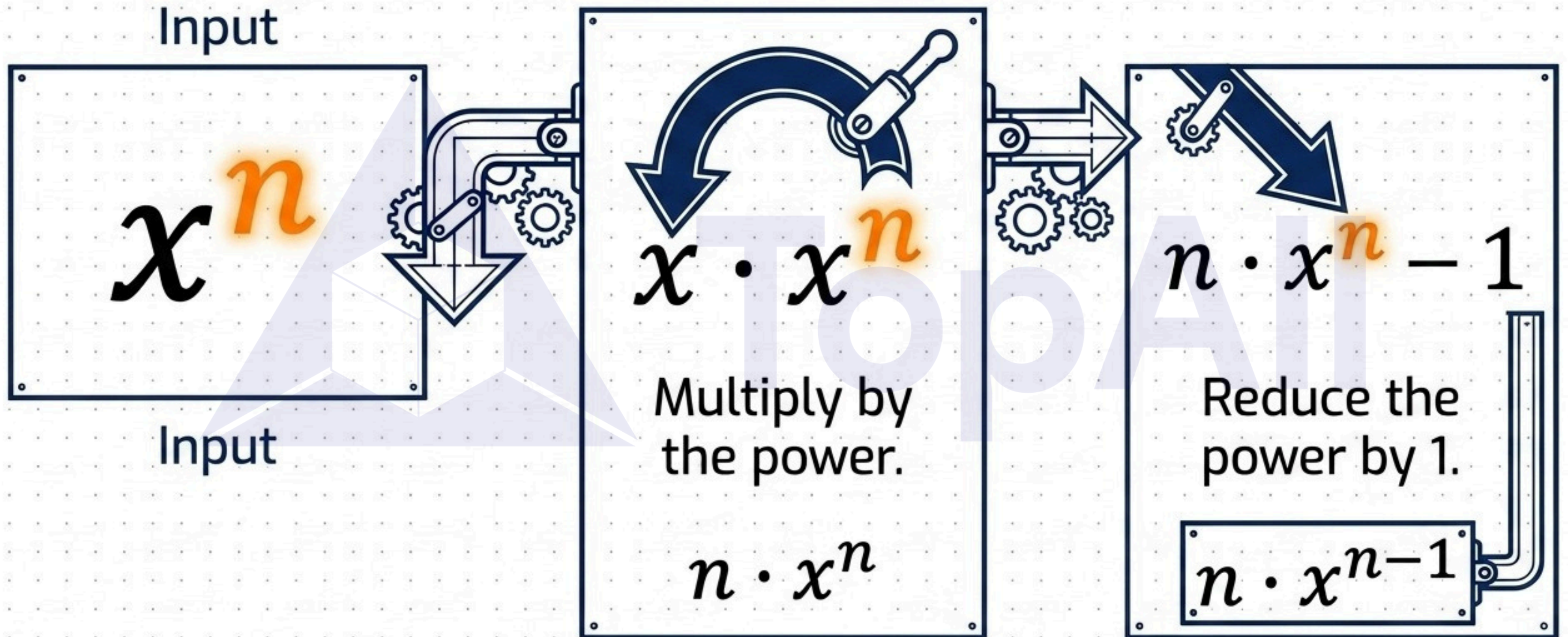
$$[g(x) = \sin(x)]$$

Core Concept: Term-Wise Differentiation

When differentiating a polynomial, treat each term **independently**. The **derivative** of a **sum or difference** is simply the sum or difference of their individual derivatives.



The Power Rule Mechanism



Visualizing Theorem 6: $(x^n)' = n \cdot x^{n-1}$



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$$E=mc^2$$



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Standard Derivative Formula Bank

Polynomial

$$(x^n)'$$



$$n \cdot x^{n-1}$$

Sine

$$(\sin x)'$$



$$\cos x$$

Cosine

$$(\cos x)'$$



$$-\sin x$$

Tangent

$$(\tan x)'$$



$$\sec^2 x$$

Cotangent

$$(\cot x)'$$



$$-\operatorname{cosec}^2 x$$

JEE TRAP ALERT: The 'Co-' Negative Sign

In the heat of an exam, it is incredibly easy to drop negative signs.

Synthesis Rule: Every standard trigonometric function starting with 'co' (cosine, cotangent, cosecant) results in a **NEGATIVE** derivative.

1

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

2

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

Mini Application: Differentiating a Polynomial



Problem:

Find the derivative of $f(x) = 6x^{100} - x^{55} + x$

Step 1: Apply Term-wise Split

$$f(x) = \left\{ \frac{d}{dx}(6x^{100}) - \frac{d}{dx}(x^{55}) + \frac{d}{dx}(x) \right\}$$

Step 2: Apply Power Rule to Each

$$6(100x^{99})$$

$$- (55x^{54})$$

$$+ (1x^0)$$

$$f'(x) = 600x^{99} - 55x^{54} + 1$$

Key Takeaways: Final Revision

Revision

Function $f(x)$	Derivative $f'(x)$
x^n	nx^{n-1}
$\sin x$	$\cos x$
$\cos x$	$-\sin x$
$\tan x$	$\sec^2 x$
$\cot x$	$-\operatorname{cosec}^2 x$

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