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The **differentiation rules** help us to evaluate the derivatives of some particular functions, instead of using the general method of differentiation. The process of differentiation or obtaining the derivative of a function has the significant property of linearity. This property makes the derivative more natural for functions constructed from the primary elementary functions, using the procedures of addition and multiplication by a constant number.

The important rules of differentiation are:

- Power Rule
- Sum and Difference Rule
- Product Rule
- Quotient Rule
- Chain Rule

Power Rule of Differentiation

This is one of the most common rules of derivatives. If x is a variable and is raised to a power n, then the derivative of x raised to the power is represented by:

$d/dx(x^n) = nx^{n-1}$

Example: Find the derivative of x^5

Solution: As per the power rule, we know;

$d/dx(x^n) = nx^{n-1}$

Hence, $d/dx(x^5) = 5x^{5-1} = 5x^4$

Sum Rule of Differentiation

If the function is sum or difference of two functions, then the derivative of the functions is the sum or difference of the individual functions, i.e.,

If $f(x)=u(x)\pm v(x)$, then;

$$\boxed{f'(x)=u'(x)\pm v'(x)}$$

Example 1: $f(x) = x + x^3$

Solution: By applying sum rule of derivative here, we have:

$f'(x) = u'(x) + v'(x)$

Now, differentiating the given function, we get;

$f'(x) = d/dx(x + x^3)$

$f'(x) = d/dx(x) + d/dx(x^3)$

$f'(x) = 1 + 3x^2$

Example 2: Find the derivative of the function $f(x) = 6x^2 – 4x$.

Solution:

Given function is: $f(x) = 6x^2 – 4x$

This is of the form $f(x) = u(x) – v(x)$

So by applying the difference rule of derivatives, we get,

$f'(x) = d/dx\ (6x^2) – d/dx(4x)$

$= 6(2x) – 4(1)$

$= 12x – 4$