Mathematics revision sheet for class 11 and class 12 physics

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Differentiation

We have two quantities x and y such that $y = f(x)$ where $f(x)$ is some function of x.We may be interested in finding followings things

1.$\frac{dy}{dx}$

2. Maximum and Minimum values of y.It can be find with the method of Maxima and Minima

$\frac{dy}{dx}$ is the called the derivative of y w.r.t to x

It is defined as

$\frac{dy}{dx} = \lim_{\Delta x \to 0} \left(\frac{\Delta y}{\Delta x} \right)$ Some commonly known functions and their derivatives are:-

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

$\frac{d(sinx)}{dx} = cosx$

$\frac{d(cosx)}{dx} = -sinx$

$\frac{d(tanx)}{dx} = sec^2$

$\frac{d(cotx)}{dx} = -cosec^2$

$\frac{d(secx)}{dx} = secxtanx$

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

$\frac{d(e^x)}{dx} = e^x$

Some important and useful rules for finding derivatives of composite

functions

1. $\frac{d}{dx}(cy) = c\frac{dy}{dx}$ where c is constant

2. $\frac{d}{dx}(a+b) = \frac{da}{dx} + \frac{da}{dx}$ where a and b are function of x

3. $\frac{d}{dx}(ab) = a\frac{db}{dx} + b\frac{da}{dx}$

4. $\frac{d}{dx}(\frac{a}{b}) = \frac{[b\frac{da}{dx} - a\frac{db}{dx}]}{b^2}$

5. $\frac{dy}{dx} = (\frac{dy}{da})(\frac{da}{dx})$

6. $\frac{d^2y}{dx^2} = (\frac{d}{dx})(\frac{dy}{dx})$

Maximum and Minimum values of y

Step 1: fine the derivative of y w.r.t x

$(\frac{dy}{dx})$

Step2 : Equate

$\frac{dy}{dx} = 0$

Solve the equation to find out the values of x

Step3: find the second derivative of y w.r.t x and calculate the values of

$\frac{d^2y}{dx^2}$

for the values of x from step2

if $\frac{d^2y}{dx^2} > 0$ then the value of x corresponds to mimina of y then y_{min} can be

find out by putting this value of x

if $\frac{d^2y}{dx^2} < 0$ then the value of x corresponds to maxima of y then y_{max} can be find out by putting this value of x

Integration

$$I = \int_a^b f(x)dx$$

It reads as integration of function f(x) w.r.t. x within the limits from x=a to x=b.

Integration of some important functions are

$\int sinx dx = -cosx$

$\int cosx dx = sinx$

$\int sec^x dx = tanx$

$\int cosec^x dx = -cotx$

$\int \frac{1}{x} dx = lnx$

$\int x^n dx = \frac{x^{n+1}}{n+1}$

$\int e^x dx = e^x$

Useful rules for integration are

$\int cf(x)dx = c \int f(x)dx$

$\int [f(x) + h(x)] = \int f(x)dx + \int h(x)dx$

$\int f(x)g(x)dx = f(x) \int g(x)dx - \int \left(f'(x) \int g(x)dx \right) dx$

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