Sunday, 6 October 2019 2:14 AM

INTEGRATION FORMULAE

METHOD OF SUBSTITUTION: $\int f(u)\,du = \int f(g(x))\,g'(x)\,dx$

INTEGRATION BY PARTS: $\int f(x)\,g'(x)\,dx = f(x)\,g(x) - \int g(x)\,f'(x)\,dx$

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

$$\int \frac{1}{x}\,dx = \ln|x| + C$$

$$\int \sin(x)\,dx = -\cos(x) + C$$

$$\int \cos(x)\,dx = \sin(x) + C$$

$$\int \sec(x)\,dx = \ln|\tan(x) + \sec(x)| + C$$

$$\int \ln(x)\,dx = x\ln(x) - x + C$$

$$\int e^x\,dx = e^x + C$$

DIFFERENTIATION FORMULAE

SUM RULE: $\frac{d}{dx}(y(x) + z(x)) = \frac{dy}{dx} + \frac{dz}{dx}$

PRODUCT RULE: $\frac{d}{dx}(yz) = \frac{dy}{dx}z + y\frac{dz}{dx}$

CHAIN RULE: $\frac{d}{dt}y(x(t)) = \frac{dy}{dx}\frac{dx}{dt}$

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

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

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

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

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

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

EXTREMA:

Given $y'(x_0) = 0$

if $y''(x_0) < 0$, $y(x)$ has a maximum point at x_0

if $y''(x_0) > 0$, $y(x)$ has a minimum point at x_0

if $y''(x_0) = 0$, $y(x_0)$ is a point of inflection

FUNDAMENTAL THEOREMS OF CALCULUS

1. $\frac{d}{dt}\int_a^t f(x)\,dx = f(t)$

2. $\int_a^t f(x)\,dx = P(t) - P(a)$

where $P(x)$ is the antiderivative of $f(x)$