Core 3 Knowledge Organiser

Differentiating $(ax + b)^n$

If $y = (ax + b)^n$ then:

$$\frac{dy}{dx} = an(ax + b)^{n-1}$$

Integrating $(ax + b)^n$

$$\int (ax + b)^n dx = \frac{1}{a} \times \frac{1}{n+1}(ax + b)^{n+1} + k$$

Trigonometry

$$sec x = \frac{1}{cos x}, \; cosec x = \frac{1}{sin x}, \; cot x = \frac{1}{tan x}$$

$$1 + tan^2\theta \equiv sec^2\theta$$

$$1 + cot^2\theta \equiv cosec^2\theta$$

$$sin(A \pm B) \equiv sinAcosB \pm cosAsinB$$

$$cos(A \pm B) \equiv cosAcosB \mp sinAsinB$$

$$tan(A \pm B) \equiv \frac{tanA \pm tanB}{1 \mp tanAtanB}$$

$$sin2A \equiv 2sinAcosA$$

$$cos2A \equiv cos^2A - sin^2A$$

$$tan2A \equiv \frac{2tanA}{1 - tan^2A}$$

$$1 + cos2A \equiv 2cos^2A$$

$$1 - cos2A \equiv 2sin^2A$$

Exponentials and Logarithms

$$\frac{d}{dx}e^x = e^x, \int e^x dx = e^x + k, \frac{d}{dx} lnx = \frac{1}{x}, \int \frac{1}{x} dx = lnx + k$$

Volumes of Revolution –

When the region under the graph of y=f(x) between x = a and x = b (where a < b) is rotated about the x-axis, the volume of the solid of revolution is:

$$\int_a^b \pi y^2 dx$$

Simpson's rule:

$$\approx \frac{1}{3}h\{(y_0 + y_n + 4(y_1 + y_3 + y_5 + \ldots) + 2(y_2 + y_4 + y_6 + \ldots)\}$$

$$h = \frac{b-a}{n}$$

n = strips

Chain rule:

If y = g(f(x)), and u = f(x) , then

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

Product rule:

If u and v are functions of x and if y = uv, then

$$\frac{dy}{dx} = \frac{du}{dx}v + u\frac{dv}{dx}$$

Quotient rule:

If u and v are functions of x and if y = u/v

$$\frac{dy}{dx} = \frac{\frac{du}{dx}v - u\frac{dv}{dx}}{v^2}$$