# Core 4 Knowledge Organiser

## Trigonometry

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

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

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

## Integration:

By parts:

$\int u.\frac{dV}{dx}$= uv - $\int v.\frac{du}{dx}$

By substitution:

- Let u = a variable
- $\frac{du}{dx}$
- Write x in terms of u
- Change limits; x in terms of u

$\int \frac{f'(x)}{f(x)}$ =ln|f(x)|+c

## Parametric Equation

Make the slack variable the subject of either equation

Make the equation in terms of x and y equal to one another.

Differentiate:
Use chain rule

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

## Partial fractions

$$\frac{ax^2+bx+c}{(px+q)(rx+s)^2}$$

$$= \frac{A}{px+q} + \frac{B}{rx+s} + \frac{C}{(rx+s)^2}$$

## Differential Equations

$$\frac{dy}{dx} = (ax+b)(cx+d)$$

$$\frac{dy}{dx} = acx^2 + dax + bcx + bd$$

$$\int \frac{dy}{dx} = \int acx^2 + (da+bc)x + bd$$

$$y = \int acx^2 + (da+bc)x + bd$$

## Implicit Differentiation

- Do $\frac{dy}{dx}$ for x terms
- For y terms, do $(\frac{dy}{dx})(\frac{d}{dy}y\ term)$
- Do product rule for any combined variables.

## Vectors

$$\underline{i} + \underline{j} + \underline{k} = \begin{pmatrix} i \\ j \\ k \end{pmatrix}$$

Unit vectors have their magnitude equal to 1.

$\underline{p}.\underline{q}$ = |p||q|cosØ.

NB: if more than one vector is present, do the dot product of the direction vectors.

## Bionomial expansion

$$(a+bx)^n$$

$$= a^n(1+\frac{b}{a}x)^n$$

$$= a^n(1+n(\frac{b}{a}x) + \frac{n(n-1)(\frac{b}{a}x)^2}{2}$$

Belongs to .....