

# Formula Sheet

## Sum and Difference of Two Cubes

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

## Sequences and Series

$$\sum_{i=1}^n i = \frac{n(n+1)}{2}$$

$$S_n = \frac{n}{2} (2a + (n-1)d)$$

$$S_n = a \left( \frac{1-r^{n+1}}{1-r} \right)$$

$$S_{\infty} = \frac{a}{1-r}$$

## Hyperbolic functions

$$\cosh(x) = \frac{e^x + e^{-x}}{2}$$

$$\sinh(x) = \frac{e^x - e^{-x}}{2}$$

## Sequences and Series

Ratio Test

$$\left| \frac{u_{n+1}}{u_n} \right|$$

Horizontal Asymptotes

$$\lim_{x \rightarrow \infty} f(x)$$

- Horizontal Asymptote

$$\lim_{x \rightarrow \infty} f(x)$$

- Maclaurin Series

$$f(0) + f'(0)x + \frac{f''(0)}{2!}x^2 + \frac{f'''(0)}{3!}x^3 + \dots$$

## Rules of Differentiation

Product Rule:

with  $y = uv$

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

Quotient Rule:

with  $y = \frac{u}{v}$

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

Chain Rule:

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

## Integration

Integration by parts:

$$\int u dv = uv - \int v du$$

Further formulae and special cases on pages 25 to 28 of the log tables provided.