

# Year 13 A-Level Mathematics

(Pure)

GUNNERSBURY  
CATHOLIC SCHOOL



## Algebraic Methods

- ✓ Proof by contradiction
- ✓ Algebraic fractions
- ✓ Partial fractions
- ✓ Repeated factors
- ✓ Algebraic division

## Sequences and Series

- ✓ Arithmetic sequences
- ✓ Arithmetic series
- ✓ Geometric sequences
- ✓ Geometric series
- ✓ Sum to infinity
- ✓ Sigma notation
- ✓ Recurrence relations
- ✓ Modelling with series

## Radians

- ✓ Radian measure
- ✓ Arc length
- ✓ Areas of sectors and segments
- ✓ Solving trigonometric equations
- ✓ Small angle approximations

## Parametric equations

- ✓ Parametric equations
- ✓ Using trigonometric identities
- ✓ Curve sketching
- ✓ Points Of intersection
- ✓ Modelling with parametric equations

## Differentiation

- ✓ Differentiating  $\sin x$  and  $\cos x$
- ✓ Differentiating exponentials and logarithms
- ✓ The chain rule
- ✓ The product rule
- ✓ The quotient rule
- ✓ Differentiating trigonometric functions
- ✓ Parametric differentiation
- ✓ Implicit differentiation
- ✓ Using second derivatives
- ✓ Rates of change

## Integration

- ✓ Integrating standard functions
- ✓ Integrating  $f(ax + b)$
- ✓ Using trigonometric identities
- ✓ Reverse chain rule
- ✓ Integration by substitution
- ✓ Integration by parts
- ✓ Partial fractions
- ✓ Finding areas
- ✓ The trapezium rule
- ✓ Solving differential equations
- ✓ Modelling with differential equations

## Functions and Graphs

- ✓ The modulus function
- ✓ Functions and mappings
- ✓ Composite functions
- ✓ Inverse functions
- ✓  $Y = |f(x)|$  and  $y = f(|x|)$
- ✓ Combining transformations
- ✓ Solving modulus problems

## Binomial Expansion

- ✓ Expanding  $(1 + x)^n$
- ✓ Expanding  $(a + bx)^n$
- ✓ Using partial fractions

## Trigonometric Functions

- ✓ Secant, cosecant, cotangent
- ✓ Graphs of  $\sec x$ ,  $\csc x$  and  $\cot x$
- ✓ Using  $\sec x$ ,  $\csc x$  and  $\cot x$
- ✓ Trigonometric identities
- ✓ Inverse trigonometric functions

## Trigonometry and modelling

- ✓ Addition formulae
- ✓ Using the angle addition formulae
- ✓ Double-angle formulae
- ✓ Solving trigonometric equations
- ✓ Simplifying  $a \cos x \pm b \sin x$
- ✓ Proving trigonometric identities
- ✓ Modelling with trigonometric

## Numerical Methods

- ✓ Locating roots
- ✓ Iteration
- ✓ The Newton-Raphson method
- ✓ Applications to modelling

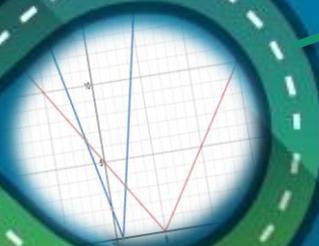
## Vectors

- ✓ 3D coordinates
- ✓ Vectors in 3D
- ✓ Solving geometric problems
- ✓ Application to mechanics

## Final A-Level Examinations

$$(x-1)(x+5) = x^2 + 4x - 5$$

$$\frac{x+5}{x-1} = \dots$$



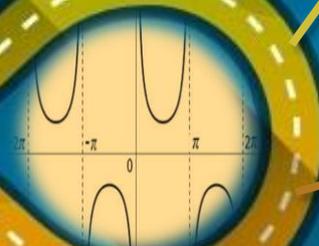
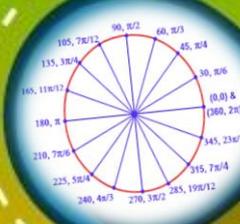
Arithmetic Sequence and Series

$$u_1, u_2, u_3, u_4, u_5$$

$$10, 15, 20, 25, 30, 35, \dots$$

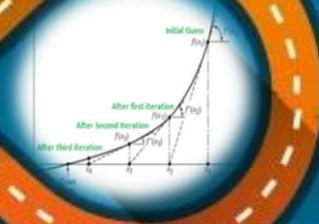
$$= 10 + 15 + 20 + 25 + 30 + 35 + \dots + u_n$$

$$(1+x)^3 = 1 + 3x + 3x^2 + x^3$$



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

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



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

$$\int \frac{1}{x^2} dx = -\frac{1}{x} + C$$

