

# Year 12 A-Level Mathematics (Pure)

GUNNERSBURY CATHOLIC SCHOOL



## Algebraic Expressions

- ✓ Index laws
- ✓ Expanding brackets
- ✓ Factorising
- ✓ Negative and fractional indices
- ✓ Surds
- ✓ Rationalising denominators

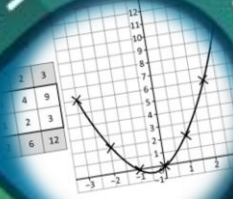
$$\sqrt{x} = x^{\frac{1}{2}}$$

$$\sqrt{xy} = \sqrt{x}\sqrt{y} = x^{\frac{1}{2}}y^{\frac{1}{2}}$$

$$\sqrt{x^3} = (x^3)^{\frac{1}{2}} = x^{\frac{3}{2}}$$

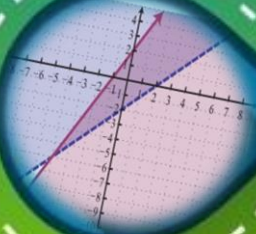
## Quadratics

- ✓ Solving quadratic equations
- ✓ Completing the square
- ✓ Functions
- ✓ Quadratic graphs
- ✓ The discriminant
- ✓ Modelling with quadratics



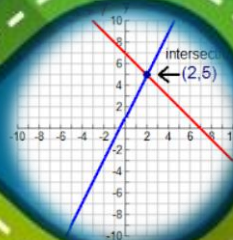
## Equations and Inequalities

- ✓ Linear simultaneous equations
- ✓ Quadratic simultaneous equations
- ✓ Simultaneous equations on graphs
- ✓ Linear inequalities
- ✓ Quadratic inequalities
- ✓ Inequalities on graphs
- ✓ Regions



## Graphs and Transformations

- ✓ Cubic graphs
- ✓ Quartic graphs
- ✓ Reciprocal graphs
- ✓ Points Of intersection
- ✓ Translating graphs
- ✓ Stretching graphs
- ✓ Transforming functions

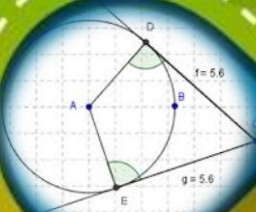


## Straight Line Graphs

- ✓  $y = mx + c$
- ✓ Equations of straight lines
- ✓ Parallel and perpendicular lines
- ✓ Length and area
- ✓ Modelling with straight lines

## Circles

- ✓ Midpoints and perpendicular bisectors
- ✓ Equation of a circle
- ✓ Intersections of straight lines and circles
- ✓ Use tangent and chord properties
- ✓ Circles and triangles



## Algebraic Methods

- ✓ Algebraic fractions
- ✓ Dividing polynomials
- ✓ The factor theorem
- ✓ Mathematical proof
- ✓ Methods of proof

$$\frac{(x-1)(2-5y+2x)+10}{(x-1)} = \frac{(x+5)}{5}$$

## The Binomial Expansion

- ✓ Pascals triangle
- ✓ Factorial notation
- ✓ The binomial expansion
- ✓ Solving binomial problems
- ✓ Binomial estimation

$$(x+y)^1 = x+y$$

$$(x+y)^2 = x^2+2xy+y^2$$

$$(x+y)^3 = x^3+3x^2y+3xy^2+y^3$$

$$(x+y)^4 = x^4+4x^3y+6x^2y^2+4xy^3+y^4$$

## Trigonometric Identities and Equations

- ✓ Angles in all four quadrants
- ✓ Exact values of trigonometric ratios
- ✓ Trigonometric identities
- ✓ Simple trigonometric equations
- ✓ Harder trigonometric equations
- ✓ Equations and identities



## Trigonometric Ratios

- ✓ The cosine rule
- ✓ The sine rule
- ✓ Areas of triangles
- ✓ Solving triangle problems
- ✓ Graphs of sine, cosine and tangent
- ✓ Transforming trigonometric graphs

## Integration

- ✓ Integrating  $x^n$
- ✓ Indefinite integrals
- ✓ Finding functions
- ✓ Definite integrals
- ✓ Areas under curves
- ✓ Areas under the x-axis
- ✓ Areas between curves and lines

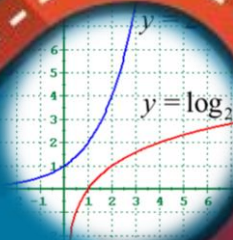
$$f'(x) = \lim_{\Delta x \rightarrow 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}$$

$$= \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$= \lim_{\Delta x \rightarrow 0} \frac{\Delta y}{\Delta x}$$

## Vectors

- ✓ Vectors
- ✓ Representing vectors
- ✓ Magnitude and direction
- ✓ Position vectors
- ✓ Solving geometric problems
- ✓ Modelling with vectors



## Differentiation

- ✓ Gradients of curves
- ✓ Finding the derivative
- ✓ Differentiating  $x^n$
- ✓ Differentiating quadratics
- ✓ Differentiating functions with or more terms
- ✓ Gradients, tangents and normal
- ✓ Increasing and decreasing functions
- ✓ Second order derivatives
- ✓ Stationary points
- ✓ Sketching gradient functions
- ✓ Modelling with differentiation

## Exponentials and Logarithms

- ✓ Exponential functions
- ✓  $Y = e^x$
- ✓ Exponential modelling
- ✓ Logarithms
- ✓ Laws of Logarithms
- ✓ Solving equations using logarithms
- ✓ Working with natural logarithms
- ✓ Logarithms and non-linear data