Download as PDF

Mathematics Advanced

Functions

- [ ] Index Laws
- [ ] Surds
- [ ] Quadratics Equation and Complete the Square
- [ ] Define a relation as a set of ordered pairs of real numbers
- [ ] Define a function as a set of ordered pairs of real numbers, where no two pairs share an x-component
- [ ] Interval Notation
- [ ] Vertical Line Test/Horizontal Line Test
- [ ] Define Odd and Even functions
- [ ] Sum, difference, product and quotient of functions
- [ ] Composite functions (incl. Domain and Range)
- [ ] x- and y- intercepts

Linear Equations

- [ ] Recognise $y = mx + c$ as the slope-intercept form
- [ ] Use $m = \frac{y_2 - y_1}{x_2 - x_1}$ to find linear gradients
- [ ] Parallel lines have the same gradient
- [ ] Perpendicular lines have negative reciprocal gradients ($m_1 \cdot m_2 = -1$)

Quadratic Equations

- [ ] Recognise features (parabolic nature, turning point, axis of symmetry, intercepts)
- [ ] Find vertex and intercepts using Quadratic Formula $x = \frac{b \pm \sqrt{b^2 - 4ac}}{2a}$
- [ ] Understand the role of the discriminant $\Delta = b^2 - 4ac$
- [ ] Find the equation of a quadratic given sufficient information
- [ ] Understand that solving $f(x) = k$ corresponds to the points where $y = f(x)$ cuts $y = k$

Cubic Equations

- [ ] Recognise the forms of a cubic:
  - [ ] $y = kx^3$
  - [ ] $y = k(k - b)^3 + c$
  - [ ] $y = (x - a)(x - b)(x - c)$

Polynomials

- [ ] Define a real polynomial as the expression $a_n x^n + a_{n-1} x^{n-1} + a_{n-2} x^{n-2} + \ldots a_{n-k} x^{n-k} \ldots + a_2 x^2 + a_1 x + a_0$
- [ ] Identify the coefficients and degree of a Polynomial
- [ ] identify the shape and features of graphs of polynomial functions of any degree in factored form
  - [ ] Sketch the graphs

Hyperbolae

- [ ] Recognise that $f(x) = \frac{k}{x}$ represents an inverse proportion
  - [ ] Identify the hyperbolic shape of inverse proportions
  - [ ] Identify asymptotes
  - [ ] Sketch the graph

Absolute values

- [ ] Identify $|x|$ as the distance on a number line between x and the origin
- [ ] Use and apply the notation $|x|$ for the absolute value of the real number x
- [ ] Sketch the graph of $y = |x|$
- [ ] Recognise and sketch $y = |ax + b|$
  - Solve algebraic equations of the form $k = |ax + b|$:
    - [ ] Algebraically
    - [ ] Graphically

Transformations of Graphs

- Given $y = f(x)$, sketch:
  - [ ] $y = -f(x)$
  - [ ] $y = f(-x)$
  - [ ] $y = -f(-x)$

Circles and Semicircles

- Identify key features of circles:
  - [ ] General Forms: $x^2 + y^2 = r^2$ and $(x - a)^2 + (y - b)^2 = r^2$
  - [ ] Centres: (a, b) or $(0, 0)$
  - [ ] Radii: r
- Recognise that a circle is not a function