Further Pure Mathematics 2

A-Level Further Mathematics · Vocabulary in context

Word	Example
Further Pure Mathematics /ˈfɜːðə pjʊə ˌmæθɪˈmætɪks/	**Further Pure Mathematics** covers complex numbers, matrices and proof.
hyperbolic functions /ˌhaɪpəˈbɒlɪk ˈfʌŋkʃnz/	sinh x and cosh x are **hyperbolic functions**. sinh x cosh x
inverse hyperbolic functions /ɪnˈvɜːs ˌhaɪpəˈbɒlɪk ˈfʌŋkʃnz/	arsinh x is one of the **inverse hyperbolic functions**. arsinh x
logarithmic form /ˌlɒgəˈrɪθmɪk fɔːm/	Write $y = e^x$ in **logarithmic form**: $x = \ln y$. $y = e^x$ $x = \ln y$
matrix equation /ˈmeɪtrɪks ɪˈkweɪʒn/	The system can be written as the **matrix equation** $Ax = b$. $Ax = b$
characteristic equation /ˌkærɪktəˈrɪstɪk ɪˈkweɪʒn/	The roots of the **characteristic equation** show how the system behaves.
eigenvalues /ˈaɪgənvæljuːz/	The **eigenvalues** of a matrix show how much it stretches its eigenvectors.
eigenvector /ˈaɪgənvektə/	The matrix scales an **eigenvector** without changing its line.
diagonal matrix /daɪˈægənl ˈmeɪtrɪks/	A **diagonal matrix** has zeros everywhere except the main diagonal.
Maclaurin's series /məˈklɔːrɪnz ˈsɪəriːz/	**Maclaurin's series** writes e^x as $1 + x + x^2/2! + \ldots$ e^x $1 + x + x^2/2! + \ldots$
completing the square /kəmˈpliːtɪŋ ðə skweə/	Use **completing the square** to read a quadratic's turning point.

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reduction formula /rɪˈdʌkʃn ˈfɔːmjʊlə/	A **reduction formula** links one integral to a simpler one.
arc length /ɑːk leŋθ/	Measure the **arc length** along the curved edge.
surface area of revolution /ˈsɜːfɪs ˈeərɪə ɒv ˌrevəˈluːʃn/	The **surface area of revolution** is found when a curve spins round an axis.
Riemann sum /ˈriːmən sʌm/	A **Riemann sum** adds the areas of thin rectangles under a curve.
complex number /ˈkɒmpleks ˈnʌmbə/	The **complex number** $4 + 3j$ has a real part of 4. $4 + 3j$ 4
De Moivre's theorem /də ˈmɔɪvəz ˈθɪərəm/	**De Moivre's theorem** says $(\cos\theta + i\sin\theta)^n = \cos n\theta + i\sin n\theta$. $(\cos\theta + i\sin\theta)^n = \cos n\theta + i\sin n\theta$
roots of unity /ruːts ɒv ˈjuːnɪti/	The fourth **roots of unity** are 1, i, −1 and −i. 1、i、−1 −i
integrating factor /ˈɪntɪgreɪtɪŋ ˈfæktə/	Multiply by the **integrating factor** to solve the equation.
general solution /ˈdʒenərəl səˈluːʃn/	The **general solution** includes the constant c. c
complementary function /ˌkɒmplɪˈmentəri ˈfʌŋkʃn/	The **complementary function** solves the equation with zero on the right.
particular integral /pəˈtɪkjʊlə ˈɪntɪgrəl/	The **particular integral** fits the right-hand side of the equation.
particular solution /pəˈtɪkjʊlə səˈluːʃn/	Use the starting value to find c and get the **particular solution**. c

Word	Example
separable variables /ˈsepərəbl ˈveərɪəblz/	With **separable variables**, put all the y terms on one side and the x terms on the other. y x
auxiliary equation /ɔːkˈsɪlɪəri ɪˈkweɪʒn/	The zero row means symmetric roots; solve the **auxiliary equation**.
catenary /kəˈtiːnəri/	A hanging chain makes the shape of a **catenary**.
exponential /ˌekspəˈnenʃl/	2^x is an **exponential** function. 2^x
reciprocal /rɪˈsɪprəkl/	The **reciprocal** of 4 is 1/4. 4 1/4
identity /aɪˈdentɪti/	$2(x + 1) = 2x + 2$ is an **identity**: it is true for every x. $2(x + 1) = 2x + 2$ x
domain /dəˈmeɪn/	Leave zero out of the **domain** when x is on the bottom of a fraction. x
range /reɪndʒ/	The **range** of $f(x) = x^2$ is all values greater than or equal to zero. $f(x) = x^2$
even function /ˈiːvən ˈfʌŋkʃən/	x^2 is an **even function**: $f(-x) = f(x)$. x^2 $f(-x) = f(x)$
odd function /ɒd ˈfʌŋkʃən/	x^3 is an **odd function**: $f(-x) = -f(x)$. x^3 $f(-x) = -f(x)$
asymptote /ˈæsɪmptəʊt/	The graph of $y = e^x$ has a horizontal **asymptote** at $y = 0$. $y = e^x$ $y = 0$
inverse function /ɪnˈvɜːs ˈfʌŋkʃn/	The **inverse function** undoes the original function.
principal branch /ˈprɪnsəpl brɑːntʃ/	arcosh x uses the **principal branch**, so its output is never negative. arcosh x

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diagonalisation /daɪˌægənəlaɪˈzeɪʃn/	**Diagonalisation** writes a matrix as PDP^{-1}, with D diagonal. PDP^{-1} D
scalar /ˈskeɪlə/	Mass is a **scalar** because it has no direction.
stretch /stretʃ/	A **stretch** makes a shape longer in one direction.
non-singular /ˌnɒnˈsɪŋgjʊlə/	A **non-singular** matrix has an inverse.
singular /ˈsɪŋgjʊlə/	A **singular** matrix has no matrix inverse.
consistent /kənˈsɪstənt/	A **consistent** system has at least one solution.
inconsistent /ˌɪnkənˈsɪstənt/	An **inconsistent** system has no solution.
linearly independent /ˈlɪnɪəli ˌɪndɪˈpendənt/	**Linearly independent** vectors do not point along each other.
Cayley–Hamilton theorem /ˈkeɪli ˈhæmɪltən ˈθɪərəm/	The **Cayley–Hamilton theorem** says a matrix satisfies its own characteristic equation.
polynomial /ˌpɒlɪˈnəʊmɪəl/	$3x^2 + 2x - 1$ is a **polynomial**. $3x^2 + 2x - 1$
differentiation /ˌdɪfəˌrenʃɪˈeɪʃn/	**Differentiation** finds how a function changes at each input.
hyperbolic /ˌhaɪpəˈbɒlɪk/	The **hyperbolic** functions sinh and cosh are built from e^x. sinh cosh e^x
coefficient /ˌkəʊɪˈfɪʃənt/	The number in front of the letter is the **coefficient**.
interval of convergence /ˈɪntəvl ɒv kənˈvɜːdʒəns/	The **interval of convergence** lists all x where the series converges. x

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diverge /daɪ'vɜːdʒ/	Outside the interval, the series can **diverge**.
chain rule /tʃeɪn ruːl/	Use the **chain rule** for a function inside another function.
implicit /ɪm'plɪsɪt/	$x^2 + y^2 = 9$ is an **implicit** equation. $x^2 + y^2 = 9$
second derivative /'sekənd dɪ'rɪvətɪv/	The **second derivative** tells us how the gradient changes.
parametric /ˌpærə'metrɪk/	$x = \cos t$, $y = \sin t$ is a **parametric** form of a circle. $x = \cos t,\ y = \sin t$
antiderivative /ˌæntɪdɪ'rɪvətɪv/	Check an **antiderivative** by differentiating it.
standard form /'stændəd fɔːm/	Write large numbers in **standard form** using powers of ten.
substitution /ˌsʌbstɪ'tjuːʃn/	Use the **substitution** $x = t + 2$ to rewrite the equation. $x = t + 2$
trigonometric /ˌtrɪgənəʊ'metrɪk/	sin x and cos x are **trigonometric** functions. sin x cos x
surd /sɜːd/	A **surd** such as $\sqrt{5}$ is a root that cannot be simplified to a whole number. $\sqrt{5}$
polar form /'pəʊlə fɔːm/	In **polar form**, a complex number uses its length and angle.
argument /'ɑːgjuːmənt/	A positive real complex number has **argument** zero.
modulus /'mɒdjʊləs/	The **modulus** of $4 + 3j$ is 5. $4 + 3j$ 5
imaginary part /ɪ'mædʒɪnəri pɑːt/	In $3 + 4i$, the **imaginary part** is 4. $3 + 4i$ 4

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unit circle /'juːnɪt 'sɜːkl/	A **unit circle** has a radius of one.
mathematical induction /ˌmæθɪ'mætɪkl ɪn'dʌkʃn/	**Mathematical induction** proves a rule for every positive whole number.
primitive root of unity /'prɪmɪtɪv ruːt əv 'juːnɪti/	The powers of a **primitive root of unity** give all the other roots.
geometric series /ˌdʒiːə'metrɪk 'sɪəriːz/	$1 + 2 + 4 + 8$ is a **geometric series**. $1 + 2 + 4 + 8$
binomial expansion /baɪ'nəʊmɪəl ek'spænʃn/	The **binomial expansion** writes $(1 + x)^3$ as $1 + 3x + 3x^2 + x^3$. $(1 + x)^3$ $1 + 3x + 3x^2 + x^3$
differential equation /ˌdɪfə'renʃl ɪ'kweɪʒn/	A **differential equation** links a quantity and its rate of change.
boundary condition /'baʊndəri kən'dɪʃn/	The **boundary condition** is that the fixed end does not move.
initial condition /ɪ'nɪʃl kən'dɪʃn/	The **initial condition** states the capacitor's starting voltage.
function /'fʌŋkʃn/	A **function** returns a value.
first-order linear equation /ˌfɜːst 'ɔːdə 'lɪnɪə ɪ'kweɪʒn/	$y' + 2y = x$ is a **first-order linear equation**. $y' + 2y = x$
resonance /'rezənəns/	**Resonance** makes the swing go very high.
transient /'trænsɪənt/	The **transient** part of the solution dies away over time.
amplitude /'æmplɪtjuːd/	Loud sounds have a large **amplitude**.

Word	Example
phase lag /ˈfeɪz læg/	The output has a **phase lag**: it peaks later than the input.

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