Further Pure Mathematics 1

A-Level Further Mathematics · Vocabulary in context

Word	Example
Further Pure Mathematics /ˈfɜːðə pjʊə ˌmæθɪˈmætɪks/	**Further Pure Mathematics** covers complex numbers, matrices and proof.
roots /ruːts/	The **roots** are where the graph crosses the x-axis.
coefficients /ˌkəʊɪˈfɪʃənts/	In $4x^2 - 7x + 1$, the **coefficients** are 4, −7 and 1.
substitution /ˌsʌbstɪˈtjuːʃn/	Use the **substitution** $x = t + 2$ to rewrite the equation.
rational function /ˈræʃənl ˈfʌŋkʃn/	A **rational function** is one polynomial divided by another.
oblique asymptote /əˈbliːk ˈæsɪmptəʊt/	$y = x + 3 + 1/x$ has the **oblique asymptote** $y = x + 3$.
method of differences /ˈmeθəd ɒv ˈdɪfrənsɪz/	The **method of differences** cancels most terms in a sum.
convergent /kənˈvɜːdʒənt/	The series $1 + ½ + ¼ + \ldots$ is **convergent**: it adds up to 2.
sum to infinity /sʌm tʊ ɪnˈfɪnɪti/	The **sum to infinity** of $1 + ½ + ¼ + \ldots$ is 2.
matrix /ˈmeɪtrɪks/	Put each day's sales in one row of the **matrix**.
zero matrix /ˈzɪərəʊ ˈmeɪtrɪks/	Every entry of a **zero matrix** is 0.
identity matrix /aɪˈdentɪti ˈmeɪtrɪks/	The **identity matrix** I has 1s on the diagonal and 0s elsewhere.

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determinant /dɪˈtɜːmɪnənt/	A nonzero **determinant** means a square matrix has an inverse.
singular matrix /ˈsɪŋgjʊlə ˈmeɪtrɪks/	A **singular matrix** has determinant 0 and no inverse.
inverse matrix /ɪnˈvɜːs ˈmeɪtrɪks/	A matrix times its **inverse matrix** gives the identity matrix.
geometric transformation /ˌdʒiːəʊˈmetrɪk trænsfɔːˈmeɪʃn/	A rotation is a **geometric transformation**.
invariant points /ɪnˈveərɪənt pɔɪnts/	**Invariant points** stay in the same place after the transformation.
invariant lines /ɪnˈveərɪənt laɪnz/	**Invariant lines** map onto themselves.
polar coordinates /ˈpəʊlə kəʊˈɔːdɪnəts/	Use **polar coordinates** to give position as distance and angle.
Cartesian coordinates /kɑːˈtiːzɪən kəʊˈɔːdɪnəts/	**Cartesian coordinates** use x and y.
polar curves /ˈpəʊlə kɜːvz/	**Polar curves** use distance r and angle θ.
plane /pleɪn/	A **plane** is a flat surface that goes on forever.
vector product /ˈvektə ˈprɒdʌkt/	The **vector product** of two vectors is at right angles to both.
vectors /ˈvektəz/	**Vectors** have size and direction.
skew lines /skjuː laɪnz/	**Skew lines** do not meet and are not parallel.

Word	Example
mathematical induction /ˌmæθɪ'mætɪkl ɪn'dʌkʃn/	**Mathematical induction** proves a rule for every positive whole number.
conjecture /kən'dʒektʃə/	A **conjecture** is a guess that still needs a proof.
inductive proof /ɪn'dʌktɪv pru:f/	An **inductive proof** shows the first case works and each case leads to the next.
symmetric functions /sɪ'metrɪk 'fʌŋkʃnz/	$\alpha + \beta$ and $\alpha\beta$ are **symmetric functions** of the roots. $\alpha + \beta$ $\alpha\beta$
discriminant /dɪ'skrɪmɪnənt/	A positive **discriminant** gives two distinct real roots.
turning points /'tɜ:nɪŋ pɔɪnts/	The curve has two **turning points**: a peak and a valley.
partial fractions /'pɑ:ʃl 'frækʃnz/	Use **partial fractions** to split $1/[s(s+1)]$ into $1/s$ minus $1/(s+1)$. $1/[s(s+1)]$ $1/s$ $1/(s+1)$
rotation /rəʊ'teɪʃn/	A **rotation** turns a shape around a point.
reflection /rɪ'flekʃn/	A **reflection** in the x-axis turns (2, 3) into (2, −3). x (2, 3) (2, −3)
enlargement /en'lɑ:dʒmənt/	An **enlargement** makes a shape bigger or smaller.
stretch /stretʃ/	A **stretch** makes a shape longer in one direction.
shear /ʃɪə/	A **shear** slides points sideways, more the further they are from a fixed line.
quartic equation /'kwɔ:tɪk ɪ'kweɪʒn/	$x^4 - 1 = 0$ is a **quartic equation** with four roots. $x^4 - 1 = 0$

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polynomial /ˌpɒlɪ'nəʊmɪəl/	$3x^2 + 2x - 1$ is a **polynomial**. $3x^2 + 2x - 1$
vertical asymptote /'vɜ:tɪkl 'æsɪmptəʊt/	The line $x = 0$ is a **vertical asymptote** of $y = 1/x$. $x = 0$ $y = 1/x$
denominator /dɪ'nɒmɪneɪtə/	The **denominator** is the bottom of a fraction.
quotient /'kwəʊʃənt/	When you divide 12 by 3, the **quotient** is 4. 12 3 4
remainder /rɪ'meɪndə/	14 divided by 5 leaves a **remainder** of 4. 14 5 4
summation /sʌ'meɪʃn/	The **summation** of 1, 2 and 3 is 6. 1、2 3 6
telescope /'telɪskəʊp/	The middle terms **telescope**, leaving only the first and last.
minor /'maɪnə/	To find a **minor**, cross out one row and one column.
cofactor /'kəʊˌfæktə/	A **cofactor** is a minor with a + or − sign. + −
rotational symmetry /rəʊ'teɪʃənl 'sɪmətri/	A square has **rotational symmetry** of order 4. 4
pole /pəʊl/	The **pole** is the centre point in polar coordinates.
initial line /ɪ'nɪʃl laɪn/	Angles in polar coordinates start from the **initial line**.
cardioid /'kɑ:diɔɪd/	A **cardioid** is a heart-shaped curve.
sector /'sektə/	A **sector** is a slice of a circle, like a piece of pizza.
normal vector /'nɔ:ml 'vektə/	A **normal vector** is at right angles to the plane.

Word	Example
perpendicular /ˌpɜːpənˈdɪkjʊlə/	The wall is **perpendicular** to the floor.
parallelogram /ˌpærəˈleləgræm/	A **parallelogram** has two pairs of parallel sides.
anti-commutative /ˌæntikəˈmjuːtətɪv/	The vector product is **anti-commutative**: $a \times b = -(b \times a)$. $$a \times b = -(b \times a)$$
scalar product /ˈskeɪlə ˈprɒdʌkt/	The **scalar product** of perpendicular vectors is zero.
unit normal /ˈjuːnɪt ˈnɔːml/	A **unit normal** has length 1 and is at right angles to the plane. $$1$$
foot of a perpendicular /fʊt əvə ˌpɜːpənˈdɪkjʊlə/	The **foot of a perpendicular** is where the shortest line meets the plane.
common perpendicular /ˈkɒmən ˌpɜːpənˈdɪkjʊlə/	The **common perpendicular** meets both skew lines at right angles.
positive integer /ˈpɒzɪtɪv ˈɪntɪdʒə/	The proof works for every **positive integer** n. $$n$$
base case /beɪs keɪs/	For this sequence, prove $n = 1$ as the **base case**. $$n = 1$$
inductive step /ɪnˈdʌktɪv step/	The **inductive step** proves the next case from the current case.
divisible /dɪˈvɪzɪbl/	Show that $5^n - 1$ is **divisible** by 4. $5^n - 1$ 4
inductive hypothesis /ɪnˈdʌktɪv haɪˈpɒθəsɪs/	The **inductive hypothesis** assumes the rule is true for $n = k$. $$n = k$$
factorial /fækˈtɔːrɪəl/	The **factorial** of 4 is $4 \times 3 \times 2 \times 1 = 24$. 4 $4 \times 3 \times 2 \times 1 = 24$

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