INKMATHS FLASHCARDS

Further Maths core results

19 cards · fronts and backs

Print double-sided, flipping on the long edge, and each answer lands behind its question. Cut along the card borders.

Definitions in precise wording, the standard results the formulae booklet does not print, a check-yourself question per topic, and the slips that lose marks. The same cards run on the website with spaced-repetition scheduling, at inkphysics.co.uk/maths/flashcards.

RECALL

State how to divide by a complex number.

FURTHER MATHS: CORE RESULTS

RECALL

State which matrix acts first in a product.

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

De Moivre's theorem:

$(\cos\theta + i\sin\theta)^n = ?$

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

Multiplying complex numbers:

$|zw| = ?$, $\arg(zw) = ?$

FURTHER MATHS: CORE RESULTS

RECALL

State the conjugate root theorem and what it is for.

FURTHER MATHS: CORE RESULTS

RECALL

State where the nth roots of a non-zero complex number sit.

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

2 × 2 determinant and inverse:

rows (a, b), (c, d): det = ?, inverse = ?

FURTHER MATHS: CORE RESULTS

RECALL

State what the determinant of a transformation matrix tells you.

FURTHER MATHS: CORE RESULTS

RECALL

In AB the right-hand matrix acts first, so AB means do B then A. Matrix multiplication does not commute, and a rotation followed by a reflection is not the same map as the reverse. Write the composite in the order the question describes the transformations, then reverse it.

FURTHER MATHS: CORE RESULTS

RECALL

Multiply top and bottom by the conjugate of the denominator. $(c + di)(c - di) = c^2 + d^2$, a real number, so the bottom clears and you are left with a real part and an imaginary part you can read off. Never split a fraction with a complex denominator term by term.

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

$|z||w|$, arg z + arg w, then add or take 2π to land in $(-\pi, \pi]$

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

$(\cos\theta + i\sin\theta)^n = \cos n\theta + i\sin n\theta$

FURTHER MATHS: CORE RESULTS

RECALL

All n of them lie on a circle of radius the nth root of the modulus, equally spaced $2\pi/n$ apart. Find one, then rotate. Joining them gives a regular n-sided polygon centred on the origin, and for n greater than 1 the roots always sum to zero. Zero is the exception. $z^n = 0$ has the single root $z = 0$, of multiplicity n, and no polygon.

FURTHER MATHS: CORE RESULTS

RECALL

A polynomial with real coefficients has its non-real roots in conjugate pairs. Given one root you get a second free, and the two multiply to a real quadratic factor you can divide out. A question that hands you $2 + 3i$ is handing you $z^2 - 4z + 13$.

FURTHER MATHS: CORE RESULTS

RECALL

Its size is the area scale factor in two dimensions and the volume scale factor in three. A negative determinant means the image has been reflected. A determinant of zero collapses the plane onto a line, so the matrix is singular and no inverse exists.

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

$ad - bc$, and for $\det \neq 0$ $\frac{1}{ad - bc}$ times rows $(d, -b)$, $(-c, a)$

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

Cubic root relations:

$az^3 + bz^2 + cz + d = 0$: $\Sigma\alpha = ?$, $\Sigma\alpha\beta = ?$, $\alpha\beta\gamma = ?$

FURTHER MATHS: CORE RESULTS

RECALL

State how to sum a series that does not start at r = 1.

FURTHER MATHS: CORE RESULTS

RECALL

State the two ways to get a Maclaurin series.

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

Volume of revolution:

V = ? (about the x-axis)

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

cosh in terms of e:

$\cosh x = ?$

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

Hyperbolic identity:

$\cosh^2 x - \sinh^2 x = ?$

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

Logarithmic form:

$\text{arsinh}\, x = ?$

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

Polar area:

A = ?

FURTHER MATHS: CORE RESULTS

RECALL

The booklet gives Σr, Σr^2 and Σr^3 from 1 to n and nothing else. For a sum from n + 1 to 2n, take the sum to 2n and subtract the sum to n. Split the terms first, and remember Σ of a constant k over n terms is nk.

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

$-(b)/(a), (c)/(a), -(d)/(a)$

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

$V = \pi \int y^2 \, dx$

FURTHER MATHS: CORE RESULTS

RECALL

Either differentiate repeatedly and evaluate every derivative at x = 0, or take a standard series from the booklet and substitute. Substituting is faster and safer, but the validity condition moves with the substitution, so $\ln(1 + 2x)$ inherits the window of $\ln(1 + x)$ with 2x in place of x: $-\frac{1}{2} < x \leq \frac{1}{2}$, right-hand end still included.

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

$\cosh^2 x - \sinh^2 x = 1$

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

$\cosh x = (e^x + e^{-x})/(2)$

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

$A = (1)/(2) \int r^2 \, d\theta$

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

$\operatorname{arsinh} x = \ln(x + \sqrt{(x^2 + 1)})$

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

Integrating factor:

$\frac{dy}{dx} + P(x)y = Q(x)$: IF = ?

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

Second order equations:

$ay'' + by' + cy = 0$: auxiliary equation?

FURTHER MATHS: CORE RESULTS

RECALL

State which particular integral to try.

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

$am^2 + bm + c = 0$

FURTHER MATHS: CORE RESULTS

STANDARD RESULT

$IF = e^{\int P\,dx}$

FURTHER MATHS: CORE RESULTS

RECALL

Match the shape of the right-hand side. A constant wants λ, a linear term $\lambda x + \mu$, a quadratic $\lambda x^2 + \mu x + \nu$, ke^{px} wants λe^{px}, and a sine or cosine wants $\lambda \cos \omega x + \mu \sin \omega x$ with both terms there. If your trial already solves the homogeneous equation, multiply by x and try again.

FURTHER MATHS: CORE RESULTS