INKMATHS FLASHCARDS

Further Maths definitions and slips

11 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.

DEFINITION

Define: Principal argument.

FURTHER MATHS: DEFINITIONS AND SLIPS

DEFINITION

Define: Invariant line.

FURTHER MATHS: DEFINITIONS AND SLIPS

DEFINITION

Define: Improper integral.

FURTHER MATHS: DEFINITIONS AND SLIPS

RECALL

State the three ways to write a plane, and how to move between them.

FURTHER MATHS: DEFINITIONS AND SLIPS

CHECK YOURSELF

Evaluate $(1 + i)^4$ without expanding four brackets.

FURTHER MATHS: DEFINITIONS AND SLIPS

CHECK YOURSELF

Find the distance from the origin to the plane $2x + 2y + z = 9$.

FURTHER MATHS: DEFINITIONS AND SLIPS

CHECK YOURSELF

Find the mean value of $f(x) = x^3$ on $[0, 2]$.

FURTHER MATHS: DEFINITIONS AND SLIPS

SPOT THE ERROR

Say what is wrong with this claim:

Differentiating cosh introduces a minus sign, just as cos does.

FURTHER MATHS: DEFINITIONS AND SLIPS

DEFINITION

A line whose every point maps to a point of the same line under the transformation. Points may move along it; none leaves it.

FURTHER MATHS: DEFINITIONS AND SLIPS

DEFINITION

For $z \neq 0$, the angle the position vector of z makes with the positive real axis, measured anticlockwise, in the interval $(-\pi, \pi]$. The origin has modulus 0 and no argument at all.

FURTHER MATHS: DEFINITIONS AND SLIPS

RECALL

Vector form is $r = a + \lambda b + \mu c$. Scalar product form is $r \cdot n = a \cdot n$, where n is normal to both direction vectors and comes from their cross product. Cartesian form is $ax + by + cz = d$, and its coefficients are that same normal, which is what makes angle and distance questions quick.

FURTHER MATHS: DEFINITIONS AND SLIPS

DEFINITION

An integral with an infinite limit or an integrand unbounded at a limit, defined as the limit of an ordinary integral, and said to converge when that limit is finite.

FURTHER MATHS: DEFINITIONS AND SLIPS

CHECK YOURSELF

$|0 + 0 + 0 - 9|/\sqrt{(4 + 4 + 1)} = 9/3 = 3$. Substitute the point, subtract the constant, divide by the length of the normal vector.

FURTHER MATHS: DEFINITIONS AND SLIPS

CHECK YOURSELF

$(1 + i)^2 = 2i$, and $(2i)^2 = -4$. Two squarings beat a binomial expansion; De Moivre gives the same via modulus $(\sqrt{2})^4 = 4$ and argument $4 \times \pi/4 = \pi$.

FURTHER MATHS: DEFINITIONS AND SLIPS

SPOT THE ERROR

Both derivatives are positive. cosh' = sinh and sinh' = cosh, with no minus anywhere in the pair. The minus already sits inside sinh's definition, doing the job the sign flip does in trig.

FURTHER MATHS: DEFINITIONS AND SLIPS

CHECK YOURSELF

$\int x^3\,dx$ from 0 to 2 is 4; dividing by the width 2 gives mean 2. Integral over width, always.

FURTHER MATHS: DEFINITIONS AND SLIPS

SPOT THE ERROR

Say what is wrong with this claim:

Polar area is the integral of $r\,d\theta$, by analogy with area under a graph.

SPOT THE ERROR

Say what is wrong with this claim:

Once the inductive step is proved, the statement holds for **all** n.

RECALL

State the trick for an induction divisibility proof.

SPOT THE ERROR

The step only passes truth along. Without a verified base case there is nothing to pass. A false formula can satisfy the step perfectly and fail at $n = 1$, so the base case carries a mark of its own and the examiner looks for it first.

FURTHER MATHS: DEFINITIONS AND SLIPS

SPOT THE ERROR

Polar regions are swept by sectors, not strips, and a sector's area is $\frac{1}{2}r^2\,d\theta$. The r comes in squared, with a half in front.

FURTHER MATHS: DEFINITIONS AND SLIPS

RECALL

Write $f(k + 1) - f(k)$, or $f(k + 1) - m\,f(k)$ for a suitable multiple m, so the assumed term drops out. What is left must show the divisor as an explicit factor. Finish with the conclusion sentence naming true for $n = 1$, assumed for $n = k$, shown for $n = k + 1$.

FURTHER MATHS: DEFINITIONS AND SLIPS