

Plex

MAA4402

Quizzes P

Tuesday 03Jan2017

MAA5404

Number Sets. An expression such as $k \in \mathbb{N}$ (read as “ k is an element of \mathbb{N} ” or “ k in \mathbb{N} ”) means that k is a natural number; a *natnum*.

\mathbb{N} = natural numbers = $\{0, 1, 2, \dots\}$.

\mathbb{Z} = integers = $\{\dots, -2, -1, 0, 1, \dots\}$. For the set $\{1, 2, 3, \dots\}$ of positive integers, the *posints*, use \mathbb{Z}_+ . Use \mathbb{Z}_- for the negative integers, the *negints*.

\mathbb{Q} = rational numbers = $\{\frac{p}{q} \mid p \in \mathbb{Z} \text{ and } q \in \mathbb{Z}_+\}$.

Use \mathbb{Q}_+ for the positive *ratnums* and \mathbb{Q}_- for the negative ratnums.

\mathbb{R} = reals. The *posreals* \mathbb{R}_+ and the *negreals* \mathbb{R}_- .

\mathbb{C} = complex numbers, also called the *complexes*.

An “*interval of integers*” [$b..c$] means the intersection $[b, c] \cap \mathbb{Z}$; ditto for open and closed intervals. So $[e..2\pi] = \{3, 4, 5, 6\} = [3..6] = (2..6]$. We allow b and c to be $\pm \infty$; so $(-\infty..-1]$ is \mathbb{Z}_- .

Floor function: $\lfloor \pi \rfloor = 3, \lfloor -\pi \rfloor = -4$.

Ceiling fnc: $\lceil \pi \rceil = 4$. Absolute value: $|-6| = 6 = |6|$ and $|-5 + 2i| = \sqrt{29}$.

Mathematical objects. Seq: ‘*sequence*’. poly(s): ‘*polynomial(s)*’. irred: ‘*irreducible*’. Coeff: ‘*coefficient*’ and var(s): ‘*variable(s)*’ and parm(s): ‘*parameter(s)*’. Expr.: ‘*expression*’. Col: ‘*Constant of Integration*’. Lol: ‘*Limit(s) of Integration*’.

Fnc: ‘*function*’ (so ratfnc: means rational function, a ratio of polynomials). cty: ‘*continuity*’. cts: ‘*continuous*’. diff’able: ‘*differentiable*’.

Soln: ‘*Solution*’. Thm: ‘*Theorem*’. Prop’n: ‘*Proposition*’. CEX: ‘*Counterexample*’. eqn: ‘*equation*’. RhS: ‘*RightHand Side*’ of an eqn or inequality. LhS: ‘*left-hand side*’. Sqrt or Sroot: ‘*square-root*’, e.g, “the sroot of 16 is 4”. Ptn: ‘*partition*’, but pt: ‘*point*’, as in “a fixed-pt of a map”.

FTC: ‘*Fund. Thm of Calculus*’. IVT: ‘*intermediate-Value Thm*’. MVT: ‘*Mean-Value Thm*’. CoV: ‘*Change-of-Variable*’.

Phrases. WLOG: ‘*Without loss of generality*’. TFAE: ‘*The following are equivalent*’. ITOF: ‘*In Terms Of*’. OTForm: ‘*of the form*’. FTSOC: ‘*For the sake of contradiction*’. Use iff: ‘*if and only if*’.

IST: ‘*It Suffices to*’ as in ISTShow, ISTExhibit.

Use w.r.t: ‘*with respect to*’ and s.t: ‘*such that*’.

Latin: e.g: *exempli gratia*, ‘*for example*’. i.e: *id est*, ‘*that is*’. QED: *quod erat demonstrandum*, meaning “end of proof”.

Plex notation. Let **SCC** mean “positively oriented simple-closed-contour”. For a **SCC** C , have $\overset{\circ}{C}$ be the (open) region C encloses, and let \widehat{C} mean C together with $\overset{\circ}{C}$. So \widehat{C} is $C \cup \overset{\circ}{C}$; it is automatically simply-connected and is a closed bounded set.

Plex [2017g] quizzes so far...

P1: Wed. 11 Jan Blanks $\in \mathbb{R}$. So $\frac{1}{2+3i} = \frac{\dots}{\dots} + i \cdot \left[\frac{\dots}{\dots} \right]$.

Thus $\frac{5-i}{2+3i} = \frac{\dots}{\dots} + i \cdot \left[\frac{\dots}{\dots} \right]$.

For z complex, $\text{Im}(z) = \text{Formula}(z, \bar{z}) = \dots$

P2: Wed. 18 Jan Suppose $[C + Di]^2 = -4i$, where $C, D \in \mathbb{R}$. Then

$C = \dots$ and $D = \dots$

On a set Ω , a *metric* is a map $d: \Omega \rightarrow [0, \infty)$ such that $\forall w, x, y, z \in \Omega$:

MS1: \dots

MS2: \dots

MS3: \dots

P3: Fri. 03 Feb Blanks $\in \mathbb{R}$. So $\frac{1}{4-3i} = \frac{\dots}{\dots} + i \cdot \left[\frac{\dots}{\dots} \right]$.

P4: Fri. 17 Feb Consider fnc $u: \mathbb{R} \times \mathbb{R} \rightarrow \mathbb{R}$ by $u(x, y) := 8x + \cos(y \cdot x)$. Its Laplacian

is $[\Delta(u)](x, y) = \dots$

There exists function $v: \mathbb{R} \times \mathbb{R} \rightarrow \mathbb{R}$ such that $f(x + iy) := u(x, y) + iv(x, y)$ is holomorphic. $T F$

PBonus: ^{Fri.}_{03 Mar} Let C be SCC $\text{Sph}_7(0)$, a circle of radius 7.

Then

$$\oint_C \frac{\cos(2z)}{[z-5]^4} dz = \dots\dots\dots$$

[Ans may be written as a product, using powers and factorials.]

P5: ^{Mon.}_{13 Mar} Writing $x + iy := [\text{P.V of } i^{[1+i]}]$ with $x, y \in \mathbb{R}$,
 then $x = \dots\dots\dots$ and $y = \dots\dots\dots$.

P6: ^{Fri.}_{14 Apr} For a SCC C , suppose fncs analytic on \hat{C} satisfy
 that $|f(z)| \geq |g(z)|$ for every $z \in C$. If $f+g$ has fewer zeros
 in $\overset{\circ}{C}$ than f does, then there must exist a point $w \in C$ such
 that $\dots\dots\dots$.

P7: ^{Mon.}_{17 Apr} Let $f(z) := z^5 + 3z^4 + 6$, and $C_r := \text{Sph}_r(0)$.
 Our f
 has $\dots\dots\dots$ zeros inside C_1 , and $\dots\dots\dots$ zeros inside C_2 .

Games Party!