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 $[\mathsf{e} \,..\, 2\boldsymbol{\pi}] = \{3, 4, 5, 6\} = [3 \,..\, 6] = (2 \,..\, 6]$. We allow b and c to be $\pm\infty$; so $(-\infty \,..\, -1]$ is $\mathbb{Z}_-$.

Mathematical objects. Seq: '*sequence*'. poly(s): '*polynomial(s)*'. irred: '*irreducible*'. Coeff: '*coefficient*' and var(s): '*variable(s)*' and parm(s): '*parameter(s)*'. Expr.: '*expression*'. CoI: '*Constant of Integration*'. LoI: '*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 Sqroot: '*square-root*', e.g, "the sqroot 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".

DfyQ quizzes so far...

D0: Mon. 31,Aug [Did not count; not collected.]

$\left[\left[\sqrt[3]{2}\right]^{\sqrt{2}}\right]^{\sqrt{8}}$ = ... $\log_8(4)$= ....

The **slope** of line $3[y - 5] = 2[x - 2]$ is ....

Point $(-4, y)$ lies on this line, where y= ....

D1: Wed. 02 Sep If $\log_B(64) = 3$ then B= ....

Line $y = [M \cdot x] + B$ owns points $(3, -4)$ and $(-2, 5)$. Hence M= .... and B= ....

D2: Wed. 09 Sep Function $h()$ satisfies $h'' - 4h' - 5h = 0$,

and initial conditions $\boxed{h(0) = 2}$ and $\boxed{h'(0) = 3}$. So

$h(t) = \alpha \mathsf{e}^{At} + \beta \mathsf{e}^{Bt}$, for numbers

α= ...., A= ...., β= ...., B= ....

D3: Wed. 16Sept The *gen.soln* $y = y(t)$ to $\boxed{y''' - 2y'' = 0}$ is

$$y = \left[\alpha \cdot \ldots\ldots\right] + \left[\beta \cdot \ldots\ldots\right] + \left[\gamma \cdot \ldots\ldots\right].$$

The fnc y satisfying $\boxed{y(0) = 2,\ y'(0) = 3,\ y''(0) = 4}$

has α= ...., β= ...., γ= ....

[Continued...]

D4: Fri. 18Sept

a Blanks∈ℝ. So $\frac{1}{2+3i} =$ ______ $+ \boldsymbol{i} \cdot$ [______].

Thus $\operatorname{Im}\left(\frac{5-\boldsymbol{i}}{2+3\boldsymbol{i}}\right) =$ ________________.

b Let $U := 3 - 2\boldsymbol{i}$ and $W := 4 + \boldsymbol{i}$. The gen.soln to a CCLDE is $y_{\alpha,\beta}(t) = \alpha \cdot \mathrm{e}^{Ut} + \beta \cdot \mathrm{e}^{Wt}$. Thus, the CCLDE that every such $y()$ satisfies is

____ $= 0$.

[*Hint:* Fill-in the blank with the appropriate sum of derivatives-of-y times various constants.]

D5: Mon. 05Oct Computing...

$[\mathbf{D} + 7\mathbf{I}]^3 \left(t^7 \cdot \mathrm{e}^{-7t}\right) =$ ________________________________

D6: Fri. 09Oct DE $\left[\mathcal{N}(x,y) \cdot \frac{\mathrm{d}y}{\mathrm{d}x}\right] + \mathcal{M}(x,y) = 0$ is *exact*, where

$$\mathcal{N}(x,y) := x + 2y \quad \text{and} \quad \mathcal{M}(x,y) := 5 + y\,.$$

Its soln $y = y(x)$ satisfies $\mathbf{F}\big(x, y(x)\big) = \text{Const}$, where $\mathbf{F}\big(x,y\big) =$ ________________________________.

D7: Mon. 12Oct The general soln $u{=}u(t)$ of

$$\frac{\mathrm{d}u}{\mathrm{d}t} = 2 \cdot [u - 5]$$

is $u_\alpha(t) =$ ________________________________.

D8: Fri. 16Oct DE $\left[2xy \cdot \frac{\mathrm{d}y}{\mathrm{d}x}\right] + [2 + 3x]y^2 = 0$ is not, alas, *exact*. Happily, multiplying both sides by (non-constant) fnc $W(x) =$ ________________________________

gives a *new* DE which *is* exact. **Did you** *Check?*

D9: Mon. 23Nov With $f(x) := x^2$ and $g(x) := \mathrm{e}^{5x}$, then

$[f \circledast g](t) =$ ________________________________.

DA: Mon. 30Nov $\mathcal{L}\left(t^{26} \mathrm{e}^{3t}\right)(s) =$ ________________________.

$\mathcal{L}\left(t^{26} \circledast \mathrm{e}^{3t}\right)(s) =$ ________________________________.

Determine the inverse-transform, please.

$\mathcal{L}^{-1}\left(\frac{3s+5}{s^2+2s+5}\right)(t) =$ ________________________________

That's All, Folks!