DfyQ
MAP2302 **Quizzes D** 19Nov2014

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 $= \{0, 1, 2, \ldots\}$.

$\mathbb{Z}$ = integers $= \{\ldots, -2, -1, 0, 1, \ldots\}$. For the set $\{1, 2, 3, \ldots\}$ 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 $[\mathrm{e} \,..\, 2\pi] = \{3, 4, 5, 6\} = [3 \,..\, 6] = (2 \,..\, 6]$. We allow b and c to be $\pm\infty$; so $(-\infty \,..\, -1]$ is $\mathbb{Z}_-$.

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*', <u>*but*</u> 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.]

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

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

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

$\alpha =$ ________, $A =$ ________, $\beta =$ ________, $B =$ ________.

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

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

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

has $\alpha =$ ________, $\beta =$ ________, $\gamma =$ ________.

[Continued...]

D4: Fri. 18Sept

a Blanks$\in\mathbb{R}$. So $\frac{1}{2+3\boldsymbol{i}} = \underline{\hspace{2cm}} + \boldsymbol{i}\cdot\left[\underline{\hspace{2cm}}\right]$.

Thus $\operatorname{Im}\left(\dfrac{5-\boldsymbol{i}}{2+3\boldsymbol{i}}\right) = \underline{\hspace{3cm}}$.

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

$$\underline{\hspace{8cm}} = 0.$$

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

D5: Mon. 05Oct Computing...

$[\mathbf{D} + 7\mathbf{I}]^3 \left(t^7 \cdot e^{-7t}\right) = \underline{\hspace{5cm}}$

D6: Fri. 09Oct DE $\left[\mathcal{N}(x,y)\cdot\frac{dy}{dx}\right] + \mathcal{M}(x,y) = 0$ 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 $\mathbf{F}\big(x,y\big) = \underline{\hspace{6cm}}$.

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

$$\frac{du}{dt} = 2\cdot[u - 5]$$

is $u_\alpha(t) = \underline{\hspace{7cm}}$.

D8: Fri. 16Oct DE $\left[2xy\cdot\frac{dy}{dx}\right] + [2+3x]y^2 = 0$ is not, alas, *exact*. Happily, multiplying both sides by (non-constant) fnc $W(x) = \underline{\hspace{7cm}}$

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

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

$\left[f \circledast g\right](t) = \underline{\hspace{7cm}}$.

DA: Mon. 30Nov $\mathcal{L}\left(t^{26} e^{3t}\right)(s) = \underline{\hspace{5cm}}$.

$\mathcal{L}\left(t^{26} \circledast e^{3t}\right)(s) = \underline{\hspace{6cm}}$.

Determine the inverse-transform, please.

$\mathcal{L}^{-1}\left(\dfrac{3s+5}{s^2+2s+5}\right)(t) = \underline{\hspace{5cm}}$

That's All, Folks!