Differential Eqns
MAP2302

S-Class

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Welcome. Write **DNE** in a blank if the described object does not exist or if the indicated operation cannot be performed. **Write expressions unambiguously e.g, "$1/a+b$" should be bracketed either $[1/a]+b$ or $1/[a+b]$. (Be careful with negative signs!)**

Use "$f(x)$ notation" when writing fncs; in particular, for trig and log fncs. E.g, write "$\sin(x)$" rather than the horrible $\sin x$ or $[\sin x]$.

Recall $[\![x \downarrow K]\!] := x\cdot[x-1]\cdot[x-2]\cdots[x-[K-1]]$, is read as "*N falling-factorial K*".

S1: Show no work.

a Prof. King wears bifocals, and cannot read small handwriting. Circle one: **True!** **Yes!** ***Who??***

b $[\mathbf{D}-3\mathbf{I}]^6\left(x^9\cdot \mathrm{e}^{3x}\right) =$ _____.

c *A* soln to $\left[f''-3f'\right](x) = 14-6x$ is **polynomial** $f(x)=$ _____. Using parameters α and β, then, the *general* solution to $\left[h''-3h'\right](x) = 14-6x$ is

$h_{\alpha,\beta}(x)=$ _____.

And the h with $h(0)=0$ and $h'(0)=0$ is $h(x)=$ _____.

d Fnc $y_\beta(t) :=$ _____ is the general soln to $\frac{\mathrm{d}y}{\mathrm{d}t} = 8t^3\cdot[y-5]$. [FOLDE or SoV]

The *particular* $y()$ with $y(0)=8$ is $y(t) :=$ _____. And this function has $y(1) =$ _____.

e Degree-N polynomial $y=y(t)$ satisfies

†: $\qquad 4y^2 - t^9y' = 15t^9 + 4t^2\,.$

Thus $N =$ _____. [*Hint:* Don't compute y; just the polynomial's degree.]

S2: Show no work.

f DiffOperators $\mathbf{P},\mathbf{Q},\mathbf{R},\mathbf{S}$ are defined as

$\mathbf{P}(f) := f(3)\cdot f'\,,\qquad \mathbf{Q}(f) := \cos(3)\cdot f^{(3)}\,,$
$\mathbf{R}(f) := [\cos(3)\cdot f] + f''\,,\quad \mathbf{S}(f) := \cos(3) + [3f']\,.$

Then . . . **P** *is linear:* T F. **Q** *is linear:* T F.
R *is linear:* T F. **S** *is linear:* T F.

g Write $\cos(-2\boldsymbol{i})$, which is real, ITOf exp() and add/sub/mul/div: $\cos(-2\boldsymbol{i})=$ _____.

And $\cos(-2\boldsymbol{i})$ lies in circle the correct interval

$(-\infty,\frac{-1}{5}]$ $(\frac{-1}{5},\frac{1}{5}]$ $(\frac{1}{5},2]$ $(2,5]$ $(5,15]$ $(15,45]$ $(45,\infty)$

End of S-Class

S1:	___ ___ ___	120pts
S2:	___ ___	40pts
Total:	___ ___ ___	160pts