

Hi. Write **DNE** if the object does not exist or the operation cannot be performed. NB: $\mathbf{DNE} \neq \{\} \neq 0$. Write expressions unambiguously e.g., “ $1/a+b$ ” should be bracketed either $[1/a]+b$ or $1/[a+b]$. (Be careful with negative signs!) And $t \neq +$; do not write them similarly!

Use “ $f(x)$ notation” when writing fncs; in particular, for trig and log fncs. E.g, write “ $\sin(x)$ ” rather 10 10 than the horrible $\sin x$ or $[\sin x]$.

W1: Show no work.

a Prof. King thinks that submitting a ROBERT LONG PRIZE ESSAY [typically 2 prizes, \$500 total] is a *really good idea*. A ten-page essay is fine. Date for the emailed-PDF is Monday, March 23, 2020.

Circle: Yes True **Résumé material!**

b Fnc $y_\alpha(t) :=$ _____

is the general soln to $\frac{dy}{dt} = 4y^2t$. [Hint: SoV.]

The fnc satisfying init.-cond. $y_\alpha(1) = 1/5$ has

$\alpha =$ _____.

c A soln to $[f'' - 3f'](x) = 14 - 6x$ is **polynomial** $f(x) =$ _____. Using parameters α and β , then, the *general* solution to $[h'' - 3h'](x) = 14 - 6x$ 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 $\frac{dy}{dt} = 8t^3 \cdot [y - 5]$. [SoV or FOLDE]

The *particular* $y()$ with $y(0) = 8$ is

$y(t) :=$ _____ . And this

function has $y(1) =$ _____.

W2: Show no work.

e Equality $e^{7t} [6\cos(4t) - 10\sin(4t)] = \alpha e^{Ut} + \beta e^{\bar{U}t}$ holds for all t , where [possibly complex] numbers are $\alpha =$ _____, $\beta =$ _____, $U =$ _____.

f Number $[i + \sqrt{3}]^{70} = x + iy$, for real numbers $x =$ _____ and $y =$ _____.

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

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

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

h DiffOperators **U, V, Q, R** are defined by

$\mathbf{U}(f) := f(4) \cdot f'$, $\mathbf{V}(f) := \cos(4) \cdot f^{(4)}$,
 $\mathbf{Q}(f) := [\cos(4) \cdot f] + f''$, $\mathbf{R}(f) := \cos(4) + [4f']$.

Then ... **U** is linear: $\mathcal{T} F$. **V** is linear: $\mathcal{T} F$.
Q is linear: $\mathcal{T} F$. **R** is linear: $\mathcal{T} F$.

End of W-Class

W1: _____ 105pts

W2: _____ 90pts

Total: _____ 195pts