Staple!

Ord: ___ ___

Differential Eqns MAP2302 **B-Class** Prof. JLF King *Touch*: 17Oct2017

Bonjour. 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!)

Do ***not*** approx.: If your result is "$\sin(\sqrt{\pi})$" then write that rather than .9797$\cdots$.

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 $[\sin x]$.

B1: Show no work.

a Fnc $y_\alpha(x) :=$ ____

is the gen. soln to $\frac{dy}{dx} = \left[\frac{1}{3}y^4 \cdot 5e^{5x}\right]$.

[*Hint:* SoV.] The fnc satisfying init.-cond. $y_\alpha(0) = 8$ has $\alpha =$ ____

b Function $h()$ satisfies $h'' - 4h' - 5h = 0$, and initial conditions $\boxed{h(0)=2}$ and $\boxed{h'(0)=3}$. So

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

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

c For $x>0$, let $B(x) := \left[x^3+7x\right]^x$. Hence its derivative is $B'(x) = B(x)\cdot M(x)$, where $M(x)$ equals

____.

d DE $\left[\mathcal{N}(x,y)\cdot\frac{dy}{dx}\right] + \mathcal{M}(x,y) = 0$ is *exact*, where

$\mathcal{N}(x,y) := \left[x^2-7\right]$ and $\mathcal{M}(x,y) := 2xy + 3e^{3x}$.

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

e DE $\left[xe^y\cdot\frac{dy}{dx}\right] + \left[8x^4+4e^y\right] = 0$ is <u>not</u>, alas, *exact*. Happily, multiplying both sides by (non-constant) fnc

$W(x) =$ ____

gives a *new* DE which <u>*is*</u> exact. **Did you *Check?***

f Blanks$\in\mathbb{R}$. So $\frac{1}{5+3i} =$ ____ $+i\cdot$ [____].

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

By the way, $|-3+7i| =$ ____.

OYOP: *In grammatical English* ***sentences****, write your essay on every* ***third*** *line* (usually)*, so that I can easily write between the lines.*

B2: Showing all the steps in the FOLDE algorithm, compute the general solution $y=y(x)$ to

$$*: \quad \frac{dy}{dx} - \frac{y}{x} = 3x^3 + x\cdot\sin(2x). \quad \left[\begin{array}{l}\text{Only consider}\\ x>0.\end{array}\right]$$

Also write it here, as

$y_\alpha(x) =$ ____.

End of B-Class

B1:	___ ___ ___	120pts
B2:	___ ___	65pts
Total:	___ ___ ___	185pts

Please PRINT your name and ordinal. Ta:

Ord: ____

HONOR CODE: *"I have neither requested nor received help on this exam other than from my professor."*

Signature: ____