Hello. [This is much longer than the actual exam. The actual exam will have *one* or *no* essay question.] Please 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 $[\sin x]$.

A1: Show no work.

[a] Fnc $y_\alpha(t) :=$ ....

is the gen. soln to $\dfrac{dy}{dt} = \left[\dfrac{-1}{6} y^4 \cdot 3^t\right]$.

[*Hint:* SoV.] The fnc satisfying init.-cond. $y_\alpha(0) = 1$

has $\alpha =$ ....

[This has a bit more computation than I would put on the actual exam. Easier is if 3^t is replaced by e^t.]

[b] Function $h()$ satisfies $2h'' + h' - h = 0$,

and initial conditions $\boxed{h(0) = 7}$ and $\boxed{h'(0) = 2}$. So

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

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

[c] $[\mathbf{D} - 7\mathbf{I}]^2\left(x^5 \cdot e^{7x}\right) =$ ....

[d] Blanks$\in \mathbb{R}$. So $\dfrac{1}{2+3i} =$ .... $+ i \cdot \left[\text{........}\right]$.

And $\dfrac{5 - i}{2 + 3i} =$ .... $+ i \cdot \left[\text{.........}\right]$.

By the way, $|5 - 3i| =$ ....

[e] We have $\left[6\cos(4t) - 10\sin(4t)\right]e^{7t} = \alpha e^{Ut} + \beta e^{\overline{U}t}$, for [possibly complex] numbers

$\alpha =$ .... , $\beta =$ .... , $U =$ ....

[f] Number $6 \cdot \exp\!\left(i \cdot \dfrac{5\pi}{3}\right)$ equals $x + yi$ for reals

$x =$ .... and $y =$ ....

With $v := \exp\!\left(-2 + 5i\right)$, then $|v| =$ ....

And $|v|$ lies in $\boxed{\text{circle the correct interval}}$

$\left[0, \tfrac{1}{2}\right), \quad \left[\tfrac{1}{2}, 1\right), \quad [1, 2), \quad [2, 4), \quad [4, 8), \quad [8, \infty)$.

[g] The solutions to $\quad 3x^2 = 2 - 2x$

are $x =$ ....

[h] With $f(t) := \displaystyle\int_{7t}^{\exp(5t)} \cos\!\left(x^2\right) dx$, then $f'(t)$ equals

....

[*Hint:* Chain rule and Fund. Thm of Calculus.]

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

....

OYOP: *In grammatical English* sentences, *write your essay on every* third *line* (usually), *so that I can easily write between the lines. Do* **not** *restate the question.*

A2: Showing all the steps in the FOLDE algorithm, compute the general solution $y()$ to

$$x^4 \tfrac{dy}{dx} + x^3 y \quad = \quad 8x^7 + x^6$$

Also write it here, as

$y_\alpha(x) =$ ....

A3: Showing all the steps in the FOLDE algorithm, compute the general solution $y()$ to

$$\frac{dy}{dx} - \frac{y}{x} = x \cdot \sin(x)$$

Also write it here, as

$y_\alpha(x) =$ ....

$\boxed{\text{End of A-Practice}}$

A1: ___ ___ ___   110pts

A2: ___ ___   85pts

A3: ___ ___   85pts

Total: ___ ___ ___   280pts

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: