Differential Eqns MAP2302 **V-Class** Prof. JLF King Wedn, 17Mar2021

Note. Write unambiguously e.g, $1/a + b$ should be *bracketed* either $[1/a] + b$ or $1/[a + b]$, as appropriate. (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 $[\sin x]$.

V1: Show no work.

a (10) See Canvas, (V1a).

b (10) The visual representation of $\mathbb{C}$ is sometimes called "the ? plane", where ? is Circle: **Unreal Higher Snakes-on-a Argand Krypton Radon Xenon Euler Gauss Please-x y-com Air Sea De Rain-in-Spain-stays-mainly-on-the** .

c (20) A certain type of bacteria increases continuously at a rate proportional to the number present. Ten hours ago there were 3,000, and now there are 12,000. In five hours there will be bacteria.

d (10 25 25) The *name* of the curve that a perfectly flexible cable takes in a uniform gravitational field is *catenary* . . . which is what results when a cat eats a canary .

On a planet with surface-acceleration $10\frac{\mathsf{m}}{\mathsf{sec}^2}$, there is a hanging cable. The cable-vertex [*where the cable-tangent is horizontal*] is at $x = 0\mathsf{m}$. At the vertex, the cable-tension is

$$\mathsf{T} := 5\mathsf{N}. \quad (\text{Newton} = \mathsf{N} = [\mathsf{kg}\cdot\mathsf{m}]/[\mathsf{sec}^2].)$$

The cable's mass-density is $2\frac{\mathsf{kg}}{\mathsf{m}}$.

Let $h(x)$ denote the height of the cable above x, as we did in class.

Using *numbers* and *units* [recall that kg=kilogram, m=meter, sec=second] write the *differential equation* we derived in class that $h()$ satisfies:

.

The cable-rise $h(2\mathsf{m}) - h(0\mathsf{m})$ equals U meters, where $U=$.

[You may use sinh(), cosh(), asinh(), acosh() if necessary. *Write your answer as simply as possible.*]

e (15) Complex number z satisfies $\cosh(z) = 3$. Thus $[\cosh(z)]^2 + [\sinh(z)]^2 =$.

f (25) *A* particular soln $y = y(t)$ to

$$\dagger: \qquad \left[\mathbf{D} - 5\mathbf{I}\right]^5(y) \quad = \quad \mathsf{e}^{3t}$$

is $y(t) =$.

[*Express your answer in simplest form.*]

g (10) *"I have neither requested nor received help on this exam other than from my professor."*

V1: ___ ___ ___ 150pts

Total: ___ ___ ___ 150pts