MAT2705-04/05 20f Quiz 0 Print Name (Last, First) Jantzen, Bob

Show all work, including mental steps, in a clearly organized way that speaks for itself. Use proper mathematical notation, identifying expressions by their proper symbols (introducing them if necessary), and use EQUAL SIGNS and arrows when appropriate. Always SIMPLIFY expressions. BOX final short answers. LABEL parts of problem. Keep answers EXACT (but give decimal approximations for interpretation). Indicate where technology is used and what type (Maple, GC). Only use technology to CHECK hand calculations, not subsitute for them, unless specifically requested.

**This is a nongraded quiz** to try out the quiz download/upload process in BlackBoard. You may print quizzes and tests if you have access to a printer, in which case you can fill in the name line, leaving the right hand corner for your recorded grade, and use this as a cover page for your work on this same sheet and/or on successive sheets. Otherwise just use Adobe Scan to create a single PDF of your response sheets with your name at the top, last COMMA first, on each (numbered) page if you use more than one 8.5x11 inch sheet of paper. Name the PDF scan **Lastname-Firstname-q0.pdf**. [Your own names!]

1. a) Check that $y = \ln(x^2 + C)$ is a solution of the differential equation $\frac{dy}{dx} = 2\,x\,e^{-y}$.

[Don't mess this up: substitute into the DE simultaneously for $y$ and $y'$ and simplify both sides until they agree; first show each step in the differentiation and simplification process to evaluate $dy/dx$.]

b) Find the solution for which $y(1) = 2$ ! oops

[Hint: the solution is not a value of $C$ but an equation giving the final result for $y$ as a function of $x$. Always backsubstitute into your original expressions when you find a relevant value of some constant.]

2. **Optional.** Enter this DE in a blank Maple worksheet (not document mode) as below, and use the context sensitive menu to "Solve DE", then select "$y(x)$". How does Maple's solution differ from the above expression. Are they equivalent? Why? Explain.

> $y' = 2\,x\,e^{-y}$

## ▶ solution

① a) $y = \ln(x^2+c)$

$\frac{dy}{dx} = \frac{1}{x^2+c}(2x+0) = \frac{2x}{x^2+C}$

$\frac{dy}{dx} = 2xe^{-y} \rightarrow \frac{2x}{x^2+c} \stackrel{?}{=} 2x\left(e^{-\ln(x^2+c)}\right)$

$\stackrel{?}{=} 2x \frac{1}{e^{\ln(x^2+c)}}$

$= \frac{2x}{x^2+c}$ ✓ yes, is a soln.

b) $2 = y(1) = \ln(1^2+c) = \ln(c+1)$

$e^2 = e^{\ln(c+1)} = c+1 \Big\} \rightarrow c = e^2-1$

$$\boxed{y = \ln(x^2+e^2-1)}$$

② $> y' = 2xe^{-y} \rightarrow \frac{d}{dx}y(x) = 2xe^{-y(x)}$

$\rightarrow y(x) = \ln(x^2 + \underbrace{2\_C1}_{=C})$

twice an "arbitrary" real number is still just a real number so removing the 2 makes a simpler formula