MAT2705-03/04 11F Test 1 Print Name (Last, First) _____|__

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 arrows and equal signs 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).

1. $\frac{dy}{dx} = -k\,(y-10)$, $y(0)=30$, $y(1)=20$

[Newton with simple numbers]

a) Hand draw in (carefully!) the solution of this differential equation satisfying the initial condition on the associated direction field to the right. Put a circled dot at the point corresponding to the initial condition. Estimate the value of x on this curve where $y=40$, putting a squared dot at this point.

b) Use the linear DE solution algorithm to find the general solution of this differential equation by hand. Simplify it and box it.

c) Find the solution of this differential equation which satisfies the given initial condition at $x=0$. Simplify it and box it.

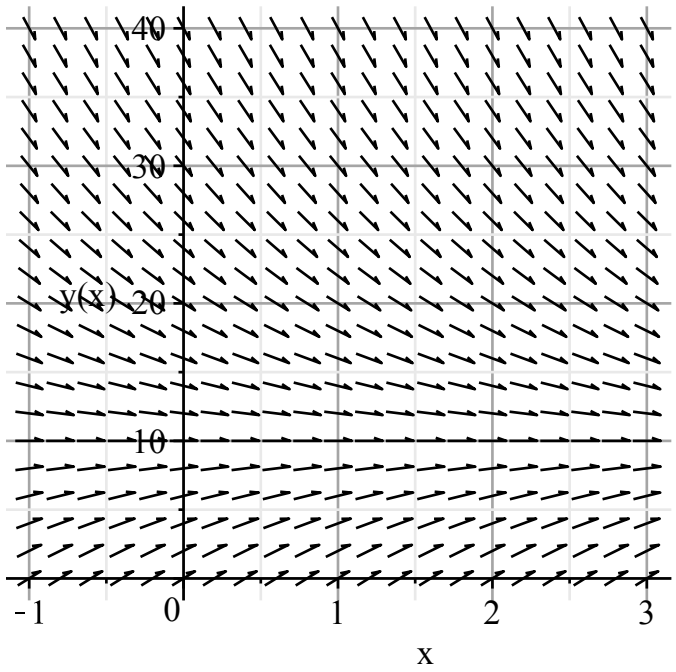
d) Use the additional condition to determine the value of the constant k exactly and to 3 significant figures.

e) Now that you have completely determined the solution function, what is the exact value of the characteristic length τ for the exponential decay of $y-10$ and its approximate value to 3 significant figures?

f) At what prior value of x does y equal 40 along this solution curve. Give your result exactly and to 3 significant figures. Is your result consistent with part a)? Explain.

g) At what value of x does the difference $y-10$ decrease to 1% of its value at $x=0$, i.e., from 20 to 0.2? Give this value exactly and to 3 significant digits.

h) Does your initial value problem solution agree with Maple? Explain why or why not.



2. $\frac{dy}{dx} = \frac{x}{2\,\tan(y)}$, $y(0)=\frac{\pi}{3}$.

a) Find the general solution of this differential equation by hand. Simplify it and box it.

[Technology provides the following derivative formula: $\int \tan(x)\,dx = -\ln|\cos(x)| + C$, although we have to add the absolute value signs.]

b) Find the solution of this differential equation which satisfies the given initial condition. Simplify it and box it.

c) Does your final result agree with Maple's? Explain if they differ in any way.

Be sure to sign and date the pledge on page 2 before handing in this test.

► solution

pledge

When you have completed the exam, please read and sign the dr bob integrity pledge and hand this test sheet in on top of your answer sheets as a cover page, with the first test page facing up:
"During this examination, all work has been my own. I give my word that I have not resorted to any ethically questionable means of improving my grade or anyone else's on this examination and that I have not discussed this exam with anyone other than my instructor, nor will I until after the exam period is terminated for all participants."

Signature: Date: