

MATH 2850: TAKE HOME 11 (25 points.)

NAME: _____

DUE: Wednesday, April 10th, at the beginning of class.

DIRECTIONS: Show all work.

1. At $t = 0$, a current of 20 amps flows through an LC circuit with inductance $L = 0.05$ H and capacitance $C = 0.2$ F. If the initial charge on the capacitor is 0 coulombs and an impressed voltage $E(t) = 2 \cos(10t)$ is present, find the current flowing in the circuit and graph your answer.

What 'effect' is in play here?

2. Find $\mathcal{L}\{e^{-t} \sinh(2t)\}$ two ways:

(a) By rewriting $e^{-t} \sinh(2t)$ as a linear combination of exponential functions.

(b) Using the Forward Shift Property.

(c) Show your answers to parts (a) and (b) are equivalent.

BONUS: Use Laplace Transforms to show: $\int_0^\infty t^n e^{-t} dt = n!$

HINT: Start by writing down the integral definition of $\mathcal{L}\{t^n\}$...