

## Homework #4 - Problem #3

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### Problem Summary

Report {NT} and {MT} for  $T = +1^\circ\text{F}$ , and the laminate effective thermal expansion coefficients  $x$ ,  $y$ , and  $xy$  for the following laminates made from IM7/977-3 Unidirectional Carbon/Epoxy.

(a) [0/30/-30]<sub>s</sub>

(b) [02/45/90]<sub>s</sub>

NT and MT should be in units of lbf/in and in-lbf/in. CTEs in units of  $1/\text{oF}$ .

### Key Solving Steps

See Eqns defined in HW4 problems 1+2. Code is broken down into smaller functions that correspond to the general forms of many equations. The specific functions used to calculate answers are NtCalc, MtCalc, and aGlobal, respectively. The functions referenced in each of these walk through the appropriate equations.

### Results

(provide requested output here; include units)

A)

Nt = (lbf/in)	Mt =	aG =
-0.1026	$(1.0\text{e-}04 \text{ lbf/in})^*$	$(1.0\text{e-}05 \text{ 1/F})^*$
0.4047	-0.0478	-0.1211
0	0.1107	0.6148
	0	0.0000

B)

Nt = (lbf/in)	Mt =	aG =
0.0745	$(1.0\text{e-}04 \text{ lbf/in})^*$	$(1.0\text{e-}05 \text{ lbf/in})^*$
0.3282	-0.0669	0.0180
-0.1268	0.1550	0.1136
	0	-0.2043

