Problem M17

In question M16. You had a state of strain:

Given a state of plane strain: ε_{11} = -0.000200, ε_{22} = +0.000400, ε_{12} = -0.000200, do the following:

a)   If a strain gauge rosette, with three gauges at 60° to each other was placed with one of the gauges orientated along the x_1 direction. What strains would the three gauges read?

b)   By representing the strains as a matrix calculate the principal strains and principal directions via the eigenvalue and eigenvectors of the matrix. Show that this is consistent with the values you calculated in M16.

c)   If the state of strain was no longer plane strain, and was now ε_{11} = -0.000200, ε_{22} = +0.000400, ε_{12} = -0.000200, ε_{33} = 0.000300, ε_{23} = 0, ε_{123} = 0. What would the principal strains now be?