

Esta ACTIVIDAD DE CLASE deberá realizarse descargando los documentos NB incompletos correspondientes a estos ejercicios de clase. Deberás seleccionar en el siguiente panel el enlace correspondiente al número que se te ha asignado en la cuenta del material personalizado de la actividad *m1-a1a*.

18-CP-C6-Mathematica-C1

001 EJERCICIO 1 CURSO 2004-5

**EXERCISE 18.1**

[A/C:15+10] The complete cubic triangle for plane stress has 10 nodes located as shown in Figure E18.1, with their triangular coordinates listed in parentheses.

Figure E18.1. Ten-node cubic triangle for Exercise 18.1. The left picture displays the superparametric element whereas the right picture shows the general isoparametric version with curved sides.

Figure E18.2. Perspective plots of the shape functions  $N_1$ ,  $N_4$  and  $N_{10}$  for the 10-node cubic triangle.

(a) Construct the cubic shape functions  $N_1^{(e)}$ ,  $N_4^{(e)}$  and  $N_{10}^{(e)}$  for nodes 1, 4, and 10 using the line-product technique. [Hint: each shape function is the product of 3 and only 3 lines.] Perspective plots of those 3 functions are shown in Figure E18.2.

(b) Construct the missing 7 shape functions by appropriate node number permutations, and verify that the sum of the 10 functions is identically one. For the unit sum check use the fact that  $\zeta_1 + \zeta_2 + \zeta_3 = 1$ .

001 EJERCICIO 2 CURSO 2004-5

**EXERCISE 18.2**

[A:15] Find an alternative shape function  $N_1^{(e)}$  for corner node 1 of the 9-node quadrilateral of Figure 18.5(a) by using the diagonal lines 5–8 and 2–9–4 in addition to the sides 2–3 and 3–4. Show that the resulting shape function violates the compatibility condition (C) stated in §18.1.

$$N_1^{(e) \text{ guess}} = c_1 L_{2-3} L_{3-4} L_{5-7} L_{6-8} = c_1 (\xi - 1)(\eta - 1)\xi\eta$$

001	<b>EJERCICIO 3</b>	CURSO 2004-5
<b>EXERCISE 18.3</b>		
[A/C:15] Complete the above exercise for all nine nodes. Add the shape functions (use a CAS and simplify) and verify whether their sum is unity.		

001	<b>EJERCICIO 4</b>	CURSO 2004-5
<b>EXERCISE 18.4</b>		
[A/C:20] Verify that the shape functions $N_1^{(e)}$ and $N_5^{(e)}$ of the eight-node serendipity quadrilateral discussed in §18.4.3 satisfy the interelement compatibility condition (C) stated in §18.1. Obtain all 8 shape functions and verify that their sum is unity.		

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<i>Each student must download the one corresponding to the number assigned to them</i>									

Una vez completado, deberá subirse adecuadamente denominado a la cuenta de entrega personal, seleccionando del siguiente panel el enlace correspondiente al número que se te ha asignado en la cuenta del material personalizado de la actividad **m1-a1a**.

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