

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**.

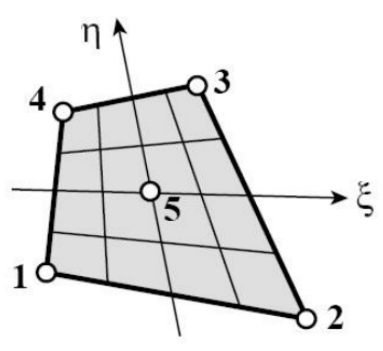
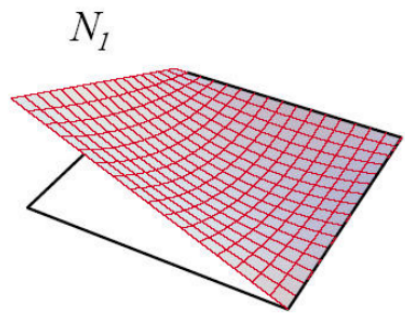
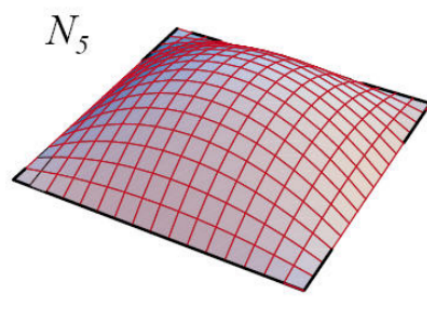
18-CP-C6-Mathematica-C2

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EJERCICIO 6
CURSO 2004-5

EXERCISE 18.6

[A:15] A five node quadrilateral element has the nodal configuration shown in Figure E18.3. Perspective views of $N_1^{(e)}$ and $N_5^{(e)}$ are shown in that Figure.² Find five shape functions $N_i^{(e)}$, $i = 1, 2, 3, 4, 5$ that satisfy compatibility, and also verify that their sum is unity.

Hint: develop $N_5(\xi, \eta)$ first for the 5-node quad using the line-product method; then the corner shape functions $\bar{N}_i(\xi, \eta)$ ($i = 1, 2, 3, 4$) for the 4-node quad (already given in the Notes); finally combine $N_i = \bar{N}_i + \alpha N_5$, determining α so that all N_i vanish at node 5. Check that $N_1 + N_2 + N_3 + N_4 + N_5 = 1$ identically.

² Although this $N_1^{(e)}$ resembles the $N_1^{(e)}$ of the 4-node quadrilateral depicted in Figure 18.4, they are not the same. That shown in Figure E18.3 must vanish at node 5, that is, at $\xi = \eta = 0$. On the other hand, the $N_1^{(e)}$ of Figure 18.4 takes the value $\frac{1}{4}$ there.

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EXERCISE 18.7

[A:15] An eight-node “brick” finite element for three dimensional analysis has three isoparametric natural coordinates called ξ , η and μ . These coordinates vary from -1 at one face to $+1$ at the opposite face, as sketched in Figure E18.4.

Construct the (trilinear) shape function for node 1 (follow the node numbering of the figure). The equations of the brick faces are:

1485 : $\xi = -1$	2376 : $\xi = +1$
1265 : $\eta = -1$	4378 : $\eta = +1$
1234 : $\mu = -1$	5678 : $\mu = +1$

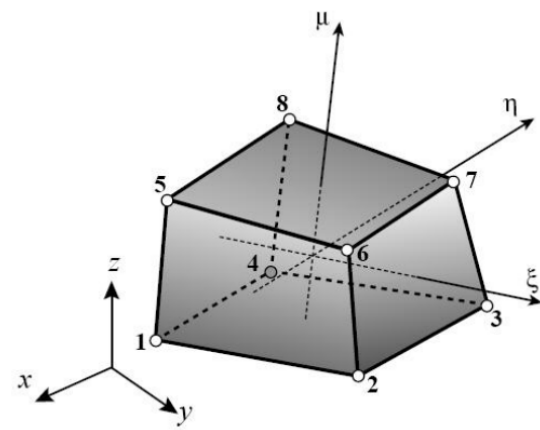
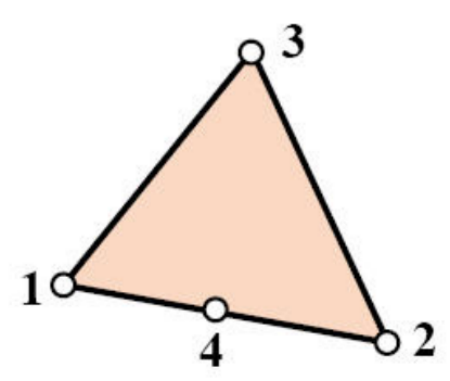


Figure E18.4. Eight-node isoparametric “brick” element for Exercise 18.7.

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EXERCISE 18.8

[A:15] Consider the 4-node transition triangular element of Figure 18.8(b). The shape function for node 1, $N_1 = \zeta_1 - 2\zeta_1\zeta_2$ was derived in §18.6.2. Show that the others are $N_2 = \zeta_2 - 2\zeta_1\zeta_2$, $N_3 = \zeta_3$ and $N_4 = 4\zeta_1\zeta_2$. Check that compatibility and completeness are verified.



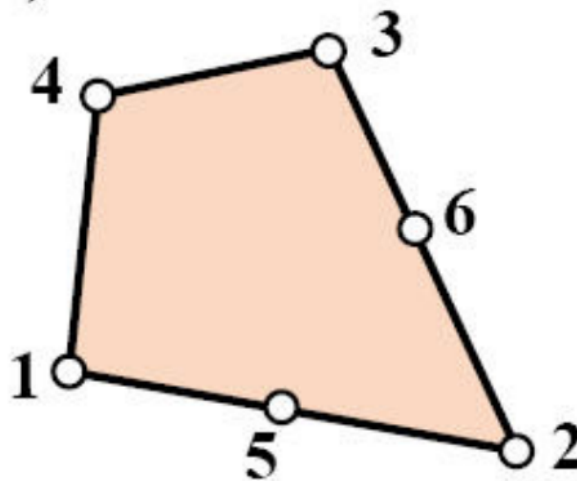
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EXERCISE 18.9

[A:20] Construct the six shape functions for the 6-node transition quadrilateral element of Figure 18.8(c). Hint: for the corner nodes, use two corrections to the shape functions of the 4-node bilinear quadrilateral. Check compatibility and completeness. Partial result: $N_1 = \frac{1}{4}(1 - \xi)(1 - \eta) - \frac{1}{4}(1 - \xi^2)(1 - \eta)$.



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Each student must download the one corresponding to the number assigned to them

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

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