

Pregunta 1

Correcte

Puntuació  
10,00 sobre  
10,00

Consider the triangular mesh meshMontseny.m that you have available on the [following link](#).

The mesh is from the Montseny Natural Park, with units (the positions of the nodes) in kilometers.

Consider the point  $P = (5, 15)$ .

- (a) (3 points)** The mean of the  $x$ -component of the three nodes of the element containing  $P$  is:
- ☐ 4.9886e+00
  - ☐ Empty answer (no penalty)
  - ☐ 4.9747e+00
  - ☒ 4.9832e+00✔
  - ☐ 4.9713e+00

Puntuació 3,00 sobre 3,00

La resposta correcta és: 4.9832e+00

**Hint:** The mean of the  $y$ -component of the three nodes of the element containing  $P$  is: 1.5127e+01

- (b) (3 points)** If point  $Q$  is the barycenter (which, as you know, is the point inside the triangle with equal barycentric coordinates) of element 3273, the distance between  $P$  and  $Q$  is:
- ☐ 4.9921e+00
  - ☐ 5.0770e+00
  - ☒ 4.9885e+00✔
  - ☐ 5.0634e+00
  - ☐ Empty answer (no penalty)

Puntuació 3,00 sobre 3,00

La resposta correcta és: 4.9885e+00

- (c) (2 points)** Let us consider the point  $R = (10, 12)$ .If the temperature at points  $P$ ,  $Q$ , and  $R$  is  $T(P) = 18.7$ ,  $T(Q) = 17.6$ , and  $T(R) = 17.2$ , what will be the interpolated temperature at point  $(8, 14)$ ?
- ☒ 1.7878e+01✔
  - ☐ 1.7976e+01
  - ☐ Empty answer (no penalty)
  - ☐ 1.8205e+01
  - ☐ 1.7692e+01

Puntuació 2,00 sobre 2,00

La resposta correcta és: 1.7878e+01

- (d) (2 points)** In a book, we saw that the surface of the Natural Park is  $S = 305 \text{ km}^2$ .
- What is the relative error of the area defined by our mesh if we take  $S$  as the true value?
- ☐ 1.8355e-02
  - ☐ 1.8642e-02
  - ☐ Empty answer (no penalty)
  - ☐ 1.8638e-02
  - ☒ 1.8511e-02✔

Puntuació 2,00 sobre 2,00

La resposta correcta és: 1.8511e-02

**Hint 1:** Recall that:  $\text{Relative Error} = \frac{|\text{Measured Value} - \text{True Value}|}{|\text{True Value}|}$

**Hint 2:** Recall that the area of a triangle with vertices  $(x_1, y_1)$ ,  $(x_2, y_2)$ ,  $(x_3, y_3)$  can be computed as

$$\frac{1}{2} \det \begin{pmatrix} 1 & x_1 & y_1 \\ 1 & x_2 & y_2 \\ 1 & x_3 & y_3 \end{pmatrix}.$$