

- The questions are designed to help you with material covered in Week 2. You will get help with them in the tutorial on 24 or 25 January.
  - You should write up your solution to the starred question (\*) clearly and hand it in to your personal tutor in your assigned tutorial on 31 January or 1 February for feedback. *Remember to put your full name and student number on the top of your solution.* Your marked solution to the feedback question will be returned to you in your tutorial on 7 or 8 February.
  - It is important that you try to do all of the questions.
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- 1: Use the chain rule of partial differentiation to express  $\partial w/\partial u$  and  $\partial w/\partial v$  as functions of  $u$  and  $v$  for

$$w = xy + yz + xz, \quad x = u + v, \quad y = u - v, \quad z = uv.$$

Show that one obtains the same result by expressing  $w$  in terms of  $u$  and  $v$  directly.  
[2012 exam question]

- 2: Find the derivative of  $f$  at the point  $P_0$  in the direction of the vector  $\mathbf{A}$  indicated.

(a)  $f(x, y) = 2xy - 3y^2$ ,  $P_0(5, 5)$ ,  $\mathbf{A} = 4\mathbf{i} + 3\mathbf{j}$ ;

(b)  $f(x, y, z) = xy + yz + xz$ ,  $P_0(1, -1, 2)$ ,  $\mathbf{A} = 3\mathbf{i} + 6\mathbf{j} - 2\mathbf{k}$ .

- (\*) 3: Find the equation of the tangent plane and the equation of the normal line at the point  $P_0(1, 0, 1)$  on the surface  $(x, y, z)$  such that  $3z + x^2 = 4$ . [2008 exam question]