Clex 6: Multivariate Chain Rules

Problem 1: One independent variable

Using chain rule determine the derivative dw/dt for the function

$$w = \ln(x^2 + y^2 + z^2),\ x = \cos(t),\ y = \sin(t),\ z = 4\sqrt(t)$$

at the point $t = 3$. (You can use direct substitution to check your work, but the goal is to use write chain rule for this case and use it correctly.)

Problem 2: Three independent variables

Using chain rule determine the partial derivatives $\partial u/\partial x$, $\partial u/\partial y$ and $\partial u/\partial z$ for the function

$$u = \frac{p-q}{q-r},\ p = x + y + z,\ q = x - y + z,\ r = x + y - z$$

at the point $(x, y, z) = (\sqrt{3}, 2, 1)$. (You can use direct substitution only to check you work.

Problem 3: Tree diagrams

Draw a tree diagram and write the chain rule for the derivatives $\partial w/\partial r$ and $\partial w/partials$ where the function w is specified by

$$w = f(x, y, z, r),\ x = g(r, s),\ y = h(s),\ z = k(r, s)$$