$$v_1 = \log w_1$$
  $v_2 = w_2 v_1$   $v_3 = \sqrt{v_2}$   $L = v_2 + v_3$   $v_1, \frac{\partial v_1}{\partial w_2}$   $v_2 = w_2 v_1$   $v_2, \frac{\partial v_2}{\partial w_2}$