1. (12) Obtain $\partial w/\partial x$ for: (a) $w = (xy)^2$; (b) $w = \ln (x^2 + y^2)^{3/2}$; (c) $w = \exp(yz/x^2)$.

2. (7) Suppose that $w = e^{3x+2y} \sin(2z)$, and that $x = \ln t$, $y = \ln (1/t + 1)$ and $z = t^2$.
   (a) Express $w$ as a function of $t$ alone, by substituting these definitions of $x$, $y$, and $z$.
   (b) Obtain the derivative, $dw/dt$. (Don't bother to factorize in this case.)
   (c) Why is this written $dw/dt$ and not $\partial w/\partial t$?

3. (6) In problem 11, you had to use the chain rule to obtain the partials $(\partial f/\partial x)_t$ and $(\partial f/\partial t)_x$, when $f$ was defined as $f(x+ct)$. A similar problem occurs in the treatment of binary solutions, when the density of a solution of A and B is expressed as $\rho(x)$, where the mole fraction $x = n_A/(n_A + n_B)$.
   (a) Obtain an expression for $(\partial \rho/\partial n_B)_{n_A}$ in terms of $(\partial \rho/\partial x)$, $n_A$, and $n_B$.
   (b) Suppose $\rho$ can be expressed as $\rho = a + bx + cx^2$. Re-express your result from (a) in terms of $n_A$, $n_B$, and the constants $a$, $b$, and $c$. 