2. Find $\partial z/\partial x$ and $\partial z/\partial y$ for the following:

(a) $z = x^2 + 3y^2$ (b) $z = xy$ (c) $z = 5x^4y^2 - 2xy^5$ (d) $z = e^{x+y}$

(e) $z = e^{xy}$ (f) $z = e^x/y$ (g) $z = \ln(x + y)$ (h) $z = \ln(xy)$

3. Find $f_1'(x, y)$, $f_2'(x, y)$, and $f_{12}''(x, y)$ for the following:

(a) $f(x, y) = x^7 - y^7$ (b) $f(x, y) = x^5 \ln y$ (c) $f(x, y) = (x^2 - 2y^2)^5$

3. Let x and y be the populations of two cities and d the distance between them. Suppose that the number of travellers T between the cities is given by

$$T = kxy/d^n \qquad (k \text{ and } n \text{ are positive constants})$$

Find $\partial T/\partial x$, $\partial T/\partial y$, and $\partial T/\partial d$, and discuss their signs.

3. The demand for a product depends on the price p of the product and on the price q charged by a competing producer. It is

$$D(p, q) = a - bpq^{-\alpha}$$

where a, b, and α are positive constants with $\alpha < 1$. Find $D_p'(p, q)$ and $D_q'(p, q)$, and comment on the signs of the partial derivatives.

4. Let $F(K, L, M) = AK^aL^bM^c$. Show that

$$KF_K' + LF_L' + MF_M' = (a + b + c)F$$

5. Find dU expressed in terms of dx and dy when $U = U(x, y)$ satisfies the equation

$$Ue^U = x\sqrt{y}$$