ECONOMICS 331
Mathematical Economics
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Homework Assignment 5

1. Consider the firm with a single factor of production defined implicitly by the relation

$$z = q^3 + 4q$$

where z is the variable input and q is output. The firm faces the following average revenue function:

$$p = 10 - 2q$$

Calculate the point elasticity of the firm's total sales revenue with respect to the amount of labour used when $q = 2$.

2. The following three equations define x, y, and w as functions of z.

$$\begin{aligned} xy - w &= 0 \\ y &= w^3 + 3z \\ w^3 + z^3 &= 2wz \end{aligned}$$

Find an expression for $\partial x/\partial z$ and evaluate it at the point where$w = z = 1$

3. The equation

$$x^2 + y^2 + z^2 + xy + xz + yz + x + y + z - 1 = 0$$

has one solution $(x, y, z) = (1, -1, -1)$. Check that the equation does indeed define z as a function of x and y at this point. Calculate the partial derivatives of z with respect to x and y at this point.

4. A simple form of the $IS - LM$ model is

$$Y = C(Y, \tfrac{M_0}{P}) + I(r) + G_0 \qquad M_0/P = L(Y, r)$$

Note that the term, $\frac{M}{P}$ appears in the consumption function. This what is sometimes referred to as the *Real Balances Effect.*

   (a) Make a sensible assumption about the sign of $\partial C/\partial(\frac{M}{P})$? Justifying your assumption (only your first sentence will be read).

   (b) Setup and sign the Jacobian of this system.

   (c) Determine the comparitive static results about how changes in M_0 affect Y and r. Use the normal economic assumptions about the derivatives of, $I(r)$ and $L(Y, r)$.

   (d) Redo (c) except this time let P be the exogenous variable that influences Y and r (remember to use the chain rule).