ECON/DARE Math Camp

Quiz

Fall 2013

*Show your work.

Problem 1

Find the first and second derivatives of the following functions. Using the results, identify the critical points and describe the function.

a) $f(x) = x^2 + 1$

b) $f(x) = x^3 + 3x^2 - 9x$

Problem 2

Find the first and second derivatives of the following functions.

a) $f(x) = (\ln x)^4 + e^{2x}$

b) $f(x) = \frac{80}{x^2} - 4x$

c) $f(x) = \frac{x^2-1}{x^3+3x}$

Problem 3

a) Find the antiderivative $F(x)$ of the following function: $f(x) = \frac{4}{x^2} + x^{3/4}$

b) Let $p(q) = \frac{1}{5}q^2$ define the supply curve (MC function) of a competitive firm, and let the optimal production level $q^* = 15$. Find the market price p^*. Illustrate the problem in a graph. Finally, calculate producer surplus using definite integrals.

Problem 4

Let the following describe an inverse demand function: $p(q) = \frac{3000}{\sqrt{q}}$

Derive and interpret an expression for the point elasticity of demand, as a function of price.

Problem 5

a) Solve for x_1^*, x_2^*:

$$\underset{\{x_1,x_2\}}{\text{Max}}\ U(x_1,x_2) = x_1 x_2$$
$$\text{s.t. } p_1x_1 + p_2x_2 = I, \text{ where } I = \text{income}$$

b) Find, sign and interpret the comparative statics: $\frac{\partial x_1^*}{\partial p_2}$ and $\frac{\partial x_2^*}{\partial p_2}$.

Problem 6

The marginal rate of substitution (MRS) describes the marginal rate of substitution across goods for a given indifference curve (constant level of utility).

Let $U(x_1, x_2) = x_1 + \ln x_2$

Find the MRS, using the total differential of the utility function, and interpret.

Problem 7

Solve the following:

a) $\begin{bmatrix} 5 & 8 & -2 \\ 1 & -3 & 4 \end{bmatrix} \times \begin{bmatrix} 0 & 1 \\ 6 & -2 \\ 10 & -1 \end{bmatrix} = ?$

b) $det \begin{bmatrix} 2 & 6 & 0 \\ -3 & 0 & 5 \\ 1 & 1 & 4 \end{bmatrix} =$