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ECON3120/4120 – Mathematics 2, fall term 06

Problems for Seminar 2, 11/9-15/9-06

1 Find the following limits:

$$\text{(a)} \lim_{x\to 0} \frac{e^x - 1 - x - \frac{1}{2}x^2}{3x^3} \qquad \text{(b)} \lim_{x\to 7} \frac{\sqrt[3]{x+1} - \sqrt{x-3}}{x-7}$$

2 The following system of equations defines $u = u(x, y)$ and $v = v(x, y)$ as C^1 functions of x and y around the point P where $(x, y, u, v) = (1, 1, 1, 1)$:

$$\begin{aligned} 2uv + v^2 &= 2x + y \\ u - v &= x^2 - y^2 \end{aligned}$$

(a) Differentiate the system. Then find the values of $\partial u/\partial x$, $\partial u/\partial y$, $\partial v/\partial x$ and $\partial v/\partial y$ at the point P.

3 Assume that the marginal cost function of a firm is

$$C'(x) = x^2 + x - 10$$

and that the fixed costs are 50. Find the cost function.

4 Find the integrals:

$$\text{(a)} \int \frac{x}{1+x^2}\,dx \qquad \text{(b)} \int_0^1 (1-2x)^{50}\,dx \qquad \text{(c)} \int_1^{e^2} \sqrt{x}\ln x\,dx$$

5 Evaluate $\displaystyle\int_0^2 2x^2(2-x)^2\,dx$. Give a rough check of the answer by sketching the graph of $f(x) = 2x^2(2-x)^2$ over $[0, 2]$.

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