

Homework 2

Due: **Wednesday, 16 October**

IMPORTANT NOTE: Please submit your assignment online through Canvas by the due date or deadline. You may write your answers in MS Word or use any other processor (e.g., LaTeX). However, the final file you upload on Canvas must be a pdf document. It is also fine to write your answers on paper and then scan them or take a high-quality image using your camera/phone and create a PDF document to upload on Canvas.

Other Notes: *Please note that the questions are based on the material covered in Lectures 3-4. There are five questions in this assignment. You must show all steps to get full credit for an answer.*

Question 1: Consider the following function

$$h(x) = \frac{x^3 + 1}{x^2 + 1}$$

- (a) (**15 points**) Use the quotient rule to find the derivative of the function, $h'(x)$.
- (b) (**5 points**) What is the value of $h'(1)$?

Question 2: Consider the following function

$$f(x) = (\ln x)(\log_2 x)$$

- (a) (**15 points**) Find $f'(x)$. (*Hint: If $\ln x = y$, then $e^y = x$; and if $\log_2 x = y$, then $2^y = x$).*)
- (b) (**5 points**) What is the value of $f'(2)$?

Question 3: Consider the function

$$f(x) = x^2 - 4x$$

Find the points (i.e., the values of x) in the given interval below where the function attains its maximum and minimum values.

- (a) (**5 points**) $[-1, 4]$
- (b) (**5 points**) $[1, 3]$
- (c) (**5 points**) $[3, 5]$
- (d) (**5 points**) $[0, \infty]$

Question 4: (**20 points**) The function f is given by

$$f(x) = (x^2 + 10x - 10)e^{-x}$$

Find the critical points of f and, for each, determine whether it is a maximum, minimum, or inflection point.

Question 5: Suppose the demand function is given by

$$q^D(p) = 70 - 4p$$

- (a) (**10 points**) Find the expression for price elasticity of demand.
- (b) (**5 points**) For what range of values of p is the expression valid, i.e., find the economically meaningful values of p ? (*Hint: Use the restriction that p and q must be non-negative; similar to what we did on page 6 of Lecture 4 Part II of II.*)
- (c) (**5 points**) For what range of values of p is the demand inelastic?