The Australian National University
EMET7001: Semester One, 2022
Tutorial 2 Questions

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To be Discussed in Week 3 Tutorials.
(Assignment Week)
(Due: 8:00 am on Monday 7 March 2022.)

Tutorial Assignment 1

This assignment involves submitting answers for each of the tutorial questions, but not for the additional practice questions, that are contained on the tutorial 2 questions sheet (this document). You should submit your answers on the Turnitin submissions link for Tutorial Assignment 1 that is available on the Wattle site for this course (under the "Assessments Items 1: Tutorial Assignments" block) by no later than 08:00:00 am on Monday 7 March 2022. If you have trouble accessing the Wattle site for this course or the Turnitin submission link, please submit your assignment to the course email address (`EMET7001@anu.edu.au`). (Please note that this email address is only used as a back-up method for submission of assessment items in this course. If you wish to consult the RSE Enquiries Team, the tutor, or myself, please use our email addresses rather than the course email address.) One of the tutorial questions will be selected for grading and your mark for this tutorial assignment will be based on the quality and accuracy of your answer to that question. The identity of the question that is selected for grading will not be revealed to students until some point in time after the due date and time for submission of this assignment.

Sources

- Bradley, T (2013), *Essential mathematics for economics and business (fourth edition)*, John Wiley and Sons, Great Britain.
- Haeussler, EF Jr, and RS Paul (1987), *Introductory mathematical analysis for business, economics, and the life and social sciences (fifth edition)*, Prentice-Hall International Edition, Prentice-Hall, USA.
- Shannon, J (1995), *Mathematics for business, economics and finance*, John Wiley and Sons, Brisbane.
- Sydsaeter, K, P Hammond, A Strom, and A Carvajal (2016), *Essential mathematics for economic analysis (fifth edition)*, Pearson Education, Italy.

Tutorial Questions

1. (Sydsaeter et al (2016, p. 162), Exercises for Section 5.5, Question 1.) Find the (Euclidean) distances between the following pairs of points.
   (a) $(1, 3)$ and $(2, 4)$.
   (b) $(-1, 2)$ and $(3, 3)$.
   (c) $(\frac{3}{2}, -2)$ and $(-5, 1)$.
   (d) (x, y) and $(2x, y + 3)$.
   (e) (a, b) and $(-a, b)$.
   (f) $(a, 3)$ and $(2 + a, 5)$.
2. (Sydsaeter et al (2016, p. 162), Exercises for Section 5.5, Question 2.) Suppose that the (Euclidean) distance between $(2, 4)$ and $(5, y)$ is $\sqrt{13}$.
   (a) Find all possible values for y.
   (b) Explain geometrically why there must be exactly two distinct values for y.
3. (Sydsaeter et al (2016, p. 95), Exercises for Section 4.2, Question 6.) Suppose that the cost of producing Q units of a commodity is given by $C(Q) = 1,000 + 300Q + Q^2$.
   (a) Compute $C(0)$, $C(100)$, and $C(101) - C(100)$.
   (b) Compute $C(Q + 1) - C(Q)$ and explain the meaning of this expression.

4. (Sydsaeter et al (2016, p. 95), Exercises for Section 4.2, Question 7.) Suppose that the demand for cotton in the U.S.A. for the period from 1915 to 1919 was estimated to be $Q = D(P) = 6.4 - 0.3P$. The variable Q stand for quantity (number of units of cotton), and the variable P stands for the price (which is measured in terms of dollars per unit of cotton).

   (a) Find the quantity of cotton that is demanded when the cotton price is (i) \$8, (ii) \$10, and (iii) \$10.22.

   (b) If the quantity of cotton that is demanded is 3.13 units, what is the price of cotton?

5. (Sydsaeter et al (2016, p. 96), Exercises for Section 4.2, Question 14.) Consider the function $f(x) = \frac{(3x+6)}{(x-2)}$.

   (a) Find the domain of this function.

   (b) Show that 5 belongs to the range of this function. (Hint: Find a value for x such that $f(x) = \frac{(3x+6)}{(x-2)} = 5$.

   (c) Show that 3 does not belong to the range of this function.

6. (Sydsaeter et al (2016, p. 411), Exercises for Section 11.1, Question 6.) Find the domains of the following functions and then illustrate those domains in the (x, y)–coordinate-plane.

   (a) $f(x, y) = \frac{x^2+y^3}{y-x+2}$.

   (b) $f(x, y) = \sqrt{2 - (x^2 + y^2)}$.

   (c) $f(x, y) = \sqrt{(4 - x^2 - y^2)\,(x^2 + y^2 - 1)}$.

Additional Practice Questions

1. What is the Euclidean distance between the following pairs of points?

   (a) $x = (1, 1, 1)$ and $y = (2, 3, 4)$.

   (b) $x = (1, 1, 1, 1)$ and $y = (2, 3, 4, 5)$.

   (c) $x = (1, 1, 1, 1, 1)$ and $y = (2, 3, 4, 5, 6)$.

2. (Sydsaeter et al (2016, p. 96), Exercises for Section 4.2, Question 15.) Consider the function $f(x) = 1 - \sqrt{x + 2}$.

   (a) Find the domain of this function.

   (b) Find the range of this function.

3. (Sydsaeter et al (2016, p. 410), Exercises for Section 11.1, Question 1.) Consider the function $f(x, y) = x + 2y$.

   (a) Find $f(0, 1)$.

   (b) Find $f(2, -1)$.

   (c) Find $f(a, a)$.

   (d) Find $f(a + h, b) - f(a, b)$.

4. This question is based in part on question 3 on page 280 of Shannon (1995). Consider a monopolist that has a (total) cost function that is given by $C(Q) = 4 + 8Q + 2Q^2$. where $Q \geq 0$ is the independent variable. Suppose that this monopolist faces a linear demand function of the form $Q(P) = \left(\frac{25}{2}\right) - \left(\frac{1}{2}\right) P$ where $P \geq 0$ is the independent variable.

   (a) What is the monopolist's inverse demand function, $P(Q)$?

   (b) What is the monopolist's (total) revenue function, $R(Q)$?

   (c) What is the monopolist's (total) profit function, $\pi(Q)$?

   (d) What is the break-even condition for the monopolist?

   (e) What is (are) the break-even level (levels) of output for the monopolist?

   (f) Draw the monopolist's (total) profit function in a diagram with Q on the horizontal axis and profit on the vertical axis.