

Assignment 3 Due: 6:00PM, Friday 24 April.

Penalties will be automatically applied to late assignments by Canvas.

Explainer: Question 1 will be completed in WebWork by 6:00PM, Friday 24 April, accessed via Assignment 3 WebWork in the Assignments section of the MAST10005 LMS Site. You should upload a scan of your solutions to Questions 2, 3 and 4 via Assignment 3 Written Part in the Assignments section of the MAST10005 LMS Site. You should write your work neatly.

1. [5 marks] This question will be completed in WebWork by 6:00PM, Friday 24 April. It will test your understanding of the properties of functions. Completing Question 1 *before* you attempt question 2 will make Question 2 easier because you will have already checked the correctness of your formula for the inverse of the function $f : \mathbb{R}^2 \rightarrow \mathbb{R}^2$ defined by $f(x, y) = (-y, x)$. You should make sure that you know the correct solution to this problem before attempting Question 2.
2. [2 method marks] Prove that your answer to Problem 3b of Q1 is actually the inverse of the function $f : \mathbb{R}^2 \rightarrow \mathbb{R}^2$ defined by $f(x, y) = (-y, x)$. You should prove carefully that *both* of the identities in Definition 2.15 in the Lecture Slides hold.
3. [3 method marks] In this question, we will use the well known function $\max : \mathbb{R}^2 \rightarrow \mathbb{R}$ defined by:

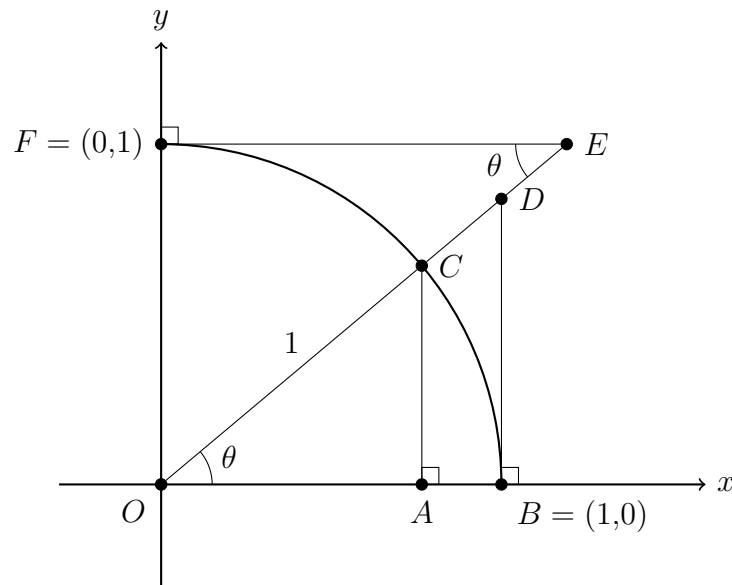
$$\max(x, y) = \begin{cases} x, & \text{if } x \geq y \\ y, & \text{if } x < y. \end{cases}$$

Consider the functions $f : [0, \infty) \rightarrow [0, \infty)$ and $g : [0, \infty) \rightarrow [0, \infty)$ defined by $f(x) = \max(x - 1, 0)$ and $g(x) = x + 1$.

- (a) Sketch the graph of f .
- (b) Give a formula for $g \circ f(x)$ for all $x \in [0, \infty)$. You can use a “two-case formula”, like the one above or express your answer using the max function.
- (c) Give a formula for $f \circ g(x)$ for all $x \in [0, \infty)$.
- (d) Is g the inverse of f ? Explain your reasoning.

Continued ...

4. [3 answer marks, 1 method mark] Consider the following diagram of trigonometric relationships in the first quadrant:



Express the lengths of the following line segments in terms of the angle θ and the six trigonometric functions discussed on Lecture Slides 198 to 200.

- (a) OA .
- (b) AC .
- (c) BD . Explain your reasoning.
- (d) EF . Explain your reasoning.
- (e) OE . Explain your reasoning.

Assignment Instructions

This assignment is worth $\frac{20}{9}\%$ of your final MAST10005 mark.

Full working should be shown in your solutions to Question 2 and 3. There will be 1 mark overall for correct mathematical notation.

There is some advice on suitable apps for scanning your assignment work on Canvas page “Guidelines for online assignment submission (written parts)” in the Assignments panel.

Full solutions to the assignment will be uploaded to the LMS site approximately 3 days after the assignment is due.