

Foundation Mathematics 1: Algebra and Trigonometry

Essential Mathematics 1: Algebra and Trigonometry

Assignment 2

Posted 6 May 2021, submission due online by 11pm on 30 May 2021 on the course website.

Total Marks = **67 (questions)+4 (presentation)=71**. Value = **20%** of Final Mark.

- **Submit online:** Assignments must be submitted online. Allow sufficient time to produce a single PDF file of reasonable size and to upload it. Look at your file and make sure that it is easy to read. Photographs with poor lighting are usually unacceptable.
 - **Format:** Use A4 sized paper. Use the whole width of the page; do not rule a line down the middle. Your student name should be clearly marked on each page. You can either handwrite or type your assignment. Note that typed mathematical expressions need to be notationally correct. If using Word to typeset your assignment, you should use Equation Editor. If this is not possible, write your assignment or those parts of the assignment by hand. Marks will be deducted for poorly presented mathematical expressions. Marks will not be deducted for neatly handwritten assignments. All your numerical answers should be exact (i.e., write π and NOT its approximation 3.1416) unless explicitly indicated. If a non-exact numerical result is required, as in Question 5, express your answer with three decimal places.
 - **Graphs:** Your graph of the functions should be done by hand. Please indicate clearly each of the relevant features asked for in the questions.
 - **Show your work:** Show all necessary steps so that the reader can follow your solution procedure. Write out your solutions clearly so that they are well organised and easy to follow. Use words. When you answer a mathematical problem you are telling a story, and that story should make sense (as well as being logical).
 - **Late submissions:** Assignments submitted late, without an extension being granted, will not be accepted.
 - **Keep a copy:** It is your responsibility to keep a copy of your assignment, and to keep your marked assignment until the final course grades have been released.
 - **Acknowledgement of work:** When submitting online, you acknowledge that the submitted assignment is your own work, unless otherwise stated.
 - **Marking:** Assignment marks will be given for correctness of mathematical solutions, layout of solution procedure, presentation of graphs, and good mathematical writing.
 - **Academic integrity:** The University's policy on academic misconduct will be strictly applied. Here are some tips to avoid academic misconduct:
 - **Do not copy** from any printed or electronic source, or from any person.
 - **Write your own solutions.** You may discuss your work with other students, but you **must** write up your solutions by yourself. You are **not allowed** to use anyone else's written work when you are writing up your assignment.
 - **Do not give inappropriate help.** Giving inappropriate help is just as serious as receiving it, and will have the same consequences. Do not show your completed assignment to other students. Dispose of draft paper so that no one can access them.
 - **Acknowledge help and joint work.** If you receive any help from another source (for example, students, tutors, friends, internet), you must make a note of it on your assignment.
 - **Consequences.** Cases of academic misconduct will be referred to the Academic Integrity Officer who will determine the suitable penalty to be applied to **all parties** involved.
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Question 1 (3+2+2+4+2+3 = 16 marks)

Consider the quadratic function in standard form: $y = -3x^2 + 6x + 9$.

- (a) Use the quadratic formula to write the function in factored form.
- (b) Find the x -intercepts of the graph of the function, if they exist.
- (c) Find the y -intercept of the graph of the function.
- (d) Write the function in vertex form by Completing the Square, and find the vertex.
- (e) Is the vertex a maximum or a minimum? Justify your answer mathematically.
- (f) Sketch a graph of the function, showing all important features. Your graph does not need to be to scale.

Question 2 (3+5+6+1+3 = 18 marks)

Consider the function $y = -2 \sin(2x - \pi)$ for $-\pi \leq x \leq 3$.

- (a) State the amplitude, period and phase shift, for this function.
- (b) Solve $-2 \sin(2x - \pi) = 0$ for $-\pi \leq x \leq 3$ to find the horizontal intercepts (x -intercepts) of the function.
- (c) Using the properties of trigonometric functions, compute the values of x for which the maximum and the minimum values of the function occur.
- (d) State the range of the function as an interval.
- (e) Using the information obtained in (a)–(d), draw the graph of $y = -2 \sin(2x - \pi)$ for $-\pi \leq x \leq 3$.

Question 3 (2+6+3 = 11 marks)

- (a) Show that $\tan^2 \theta = \frac{1}{3}$ if and only if $\sin^2 \theta = 1/4$.
- (b) Use part (a) to find all the values of θ , $-\pi \leq \theta \leq 2\pi$, for which $\tan^2 \theta = \frac{1}{3}$. Give your answers in radians.
- (c) Verify the following trigonometric identity: $\cos^4 t - \cos^2 t = \sin^4 t - \sin^2 t$

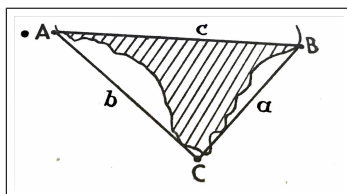
Question 4 (4+2+3+3+4 = 16 marks)

- (a) Find the equation of the line passing through the points $(2, -1)$ and $(0, 3)$. Give your answer in standard form $Ax + By = C$.
- (b) Find the slope of a line that is perpendicular to the line obtained in part (a) and give a reason for your answer.
- (c) Find the equation of the line that is perpendicular to the line obtained in part (a) and that passes through the point $(5, -5)$. Give your answer in standard form.
- (d) Graph (by hand) the two equations obtained in part (a) and part (c) on the same Cartesian axes. Label the coordinates of the point of intersection between these lines.
- (e) Solve the system of equations obtained in part (a) and part (c) by using the elimination method. Marks will be awarded for checking your solution.

Question 5 (6 marks)

In the figure below (not drawn in scale), the points A, B, and C represent the locations of three hospitals on the shore of a peninsula. These hospitals use drones to safely send medicines from one hospital to another.

A drone departs from A in direction to C, travels at 35 km per hour, and takes 45 minutes until it arrives at C. Another drone, departing from B to C, traveling at 40 km per hour takes 30 minutes until it arrives at C. The drones' paths are indicated in the Figure below as segments b (from A to C) and a (from B to C), respectively. The angle ACB (at the tip of the peninsula in the picture) is 85° . Deduce the distance between the towns A and B and. Express your final answer in 3 decimal places.



There are **four (4) marks** available for **presentation** and **communication**:

Excellent (4 marks)	Notation is proficient and accurate. Layout is clear and easy to follow. Graphs are appropriate and very well presented. Presentation requirements have been met.
Good (3 marks)	Notation is generally appropriate, with some inaccuracies. Layout is mostly clear and easy to follow. Graphs are mostly appropriate and well presented. Presentation requirements have been mostly met.
Satisfactory (2 marks)	Notation has several inaccuracies. Layout is adequate. Some attempt has been made to produce appropriate graphs. Presentation is satisfactory.
Poor (1 mark)	Limited accuracy of notation. Layout is poor. Limited attempt has been made to produce appropriate graphs. Presentation is adequate.
None (0 marks)	Inadequate.

End of assignment