

Assignment 1. Due date: Thursday 2 April 2009.

This assignment is due by 4pm on Thursday 2 April 2009. It should be posted in the glass-fronted collection boxes on the verandah of Carslaw Level 3. These boxes are at the end of the verandah closest to Eastern Avenue. (NOT the glass-fronted collection boxes near the pyramids on Carslaw Level 3, nor the open wooden pigeonholes.) Please do not post your assignment before Thursday 2 April 2009, since the boxes are also used for the collection of assignments in other units. Your assignment must be stapled inside a manilla folder, a cover sheet must be signed and attached, and you must write the initial of your family name as a large letter on the front of the folder. See page 26 of the Junior Mathematics and Statistics Handbook for further guidelines re submission of assignments.

1. Consider the function $f(x) = x^2 - 2x - 15$.
 - (a) Factorise $f(x)$.
 - (b) Find the points where the graph of $y = f(x)$ cuts the x -axis.
 - (c) Graph $y = f(x)$, marking on your diagram any points where the curve cuts the x and y axes.

2. Find the amplitude and period of $f(t) = -2 \cos(\pi t - 5)$.

3. Solve $\sin(x + \frac{\pi}{4}) = \frac{1}{\sqrt{2}}$ for $0 \leq x \leq \pi$.

4. Consider the function $f(x) = \frac{x + 1}{x^2 + 2x - 3}$.
 - (a) Find the domain of $f(x)$.
 - (b) Does the range include 1? Show your working.
 - (c) Find $f(2)$.
 - (d) Find and simplify $f(x - 1)$.
 - (e) Does the graph of $y = f(x)$ cut the x -axis? If so, where?

5. Four hours ago a biologist observed the size of a bacteria population grow from a size of 1000 to a size of 1450 in an hour.
 - (a) Find an exponential function of the form $P(x) = P_0 e^{kx}$ that models this situation, where $P(x)$ is the size of the bacteria population and x is the number of hours (from when the population was 1000).
 - (b) According to these calculations, what is the current size of the bacteria population?
 - (c) When will the original size of the population have grown by a factor of ten?