IM3 Unit 2 Exam - Paper 1 (Calculator Inactive)

November 2017

Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written work. You are advised to show all working.

SECTION A

Answer all questions in the spaces provided.

1. Given the function $f(x) = 2(3)^x$

   a. Evaluate $f(2)$. [1m]

   b. $f(x)$ is shifted up four units and left two units. What is the y-intercept of the new function? [3m]

   c. Write the equation of the inverse function of $f(x) = 2(3)^x$. [2m]

   d. Evaluate $f^{-1}(6)$ [2m]

2. Given the following sequence of numbers: $\{0.75,\ -1.5,\ 3,\ -6,\ ...\}$

   a. Describe the pattern. [1m]

   b. What are the next three terms in the sequence? [2m]

   c. Write a model for this sequence of numbers (Hint: Use an exponential equation) [2m]

   d. Hence or otherwise, find the 10th term in this sequence. [2m]

3. Given that $log_3 2 = 0.63$, $log_3 3 = 1$, and $log_3 5 = 1.46$ use your understanding of logarithm rules to find the values of the following expressions. All answers to two decimal places. [6m]

   a. $log_3(10) =$

   b. $log_3(75) =$

   c. $log_3(2.5) =$

4. Solve the following equations, to get full marks, show the key steps in your calculations. [12m]

   a. $4^x = \frac{1}{16}$

   b. $log_3 x = 4$

   c. $log_4(2x + 4) = 2$

   d. $x = log_4 64 + 16^{0.5} - 27^{\frac{2}{3}}$

5. Mr. S spills some radioactive material in his coffee! This material has a half life of 4 hours.
    a. If there were 100mg at the start of his spill, how much will be left after 8 hours? [3m]

    b. The coffee will no longer be dangerous once there is only less than 6.25% of the radioactive material left (Hint: $100 \div 16 = 6.25$). How many hours must Mr. S wait until he can safely drink his coffee? [3m]