Coursework reports 2015–16
CO0001 Mathematics for business – Coursework (Test) 2

General remarks

There were five questions on this coursework and most candidates had time to attempt all five. The coursework followed the same format as in the previous year and covered the same range of material. When preparing for the coursework it is helpful to look at those from other years and ensure you understand the relevant topics and practise typical questions, so you are familiar with the relevant parts of the syllabus. This year the extra time allowed resulted in more students attempting all questions. It is still not advisable to spend too long on one section of a question, such as drawing a graph, at the expense of answering other sections.

Comments on specific questions

Question 1

This question tested the ability of students to combine functions together correctly in part (a) and then differentiate composite functions in part (b).

In (a) students were told they did not need to simplify the resulting functions and that meant there was no need to carry out algebraic manipulations of the expressions found. For example in (i) $g(f(x)) = \frac{1}{(x+2)^2}$ is a sufficient answer and in (iv) there is no need to expand the solution $(f(x))^3$.

However, in part (b) it sometimes simplified the differentiation if the composite function was manipulated first. Thus in (i) $f(x) \times g(x) = (x+2)x^2$ and this expands easily to give x^3+2x^2. This is easier to differentiate than the first expression which requires applying the product rule. In (iii) the expression $(x+2).\frac{1}{x^2}$ can be separated into $\frac{x}{x^2} + \frac{2}{x^2}$ and simplified into $\frac{1}{x} + \frac{2}{x^2}$ and differentiated to give $-\frac{1}{x^2} - \frac{4x}{x^3}$. If not the quotient rule may be applied to obtain an equivalent result. Students need to study composite functions and be able to work with the chain rule and product and quotient rules as well as know the basic derivatives of algebraic, log and exponential functions.

Question 2

This question tested the ability of students to add, subtract, transpose and multiply matrices together, as well as multiply a matrix by a scalar. These basic matrix operations are straightforward and students should prepare by ensuring they know the relevant techniques and how to apply them before they take the test.

Question 3

In part (a) the first series is an Arithmetic Progression with $a = 3,\ d = 5$ and the nth term equal to 63. Thus n can be found by solving the equation $a + (n-1)d = 63$ to give $n = 12$. So the summation has lower limit $k = 1$, upper limit $k = 12$ and general term $3 + (k-1)5$.

The second series is a Geometric Progression with $a = \frac{1}{2},\ r = \frac{1}{2}$ and nth term $\frac{1}{2^6}$. This gives $n = 6$ and the summation has lower limit $k = 1$, upper limit $k = 6$ and general term $\frac{1}{2^k}$.

In part (b) students were asked to find the sum of the second series. If the formula is known then it is a simple matter of substituting into the expression $S_n = a\frac{(1-r^n)}{(1-r)}$. This gives the solution 0.98 to two decimal places.

Question 4

The cubic equation in this question has the form $y = x(x-2)(x-3)$ since the three roots are given. In part (a) students should be aware of the general shape of a cubic graph and use the given information to sketch it showing the three intercepts. The intercept on the y axis is given by the constant term which is zero. An appropriate scale on the x axis would be from -1 to 5. Students should choose a scale which includes the intercepts. Some students unfortunately treated the cubic equation as a quadratic and tried to apply the quadratic formula to it to find its roots.

An area in part (b) is found by integrating the expression between the limits $x = 0$ and $x = 2$ with respect to x, since this is the part of the graph which is above the axis, giving an area here of 2.678 square units.

In part (c) students are told the integral of the function with respect to x between the limits 0 and 3 which comes to 2.25. This represents the area above and below the x axis combined. Thus the required integral is $2.25 - 2.678 = -0.428$. Corrected back to two decimal places this gives the answer -0.43.

Question 5

The final question is about exponential and logarithmic functions. For the first part of this question students simply substitute 5 for t in the equation to find S after 5 weeks. Since this represents a number of games sold it should be rounded up or down to the nearest whole number – in this case 38843 games sold.

In part (b) S is given and then the equation must be re-arranged to find t. So $e^{-0.3t} = 1 - \frac{3}{5}$. Then logs of both sides are taken to give $-0.3t = ln(\frac{2}{5})$ and $t = 3.05$. So the answer is that sales reach 30000 in the fourth week.

For (c) the general trend of sales over time is that they increase exponentially towards a ceiling of 50000.