Feedback for Coursework Assignment 1

The coursework was marked out of 100. Generally, the standard of the answers was good, with a class average of about 79%. To find out how well you did, I suggest comparing your personal score with this average.

- **Question 1** was answered very well by most students. A small minority made a small mistake in factorising the denominator and that led to completely different results. It is good practice to record the final numerical values at the end of your solution (e.g., $A = ...$, $B = ...$, $C = ...$, and so on).

- **Question 2**: Part (a) was answered well by many students, although very few provided complete details. Just by equating the one-sided limits at $x = 2$ does not answer the continuity of the given function at other points in its domain. No significant penalties were applied for these incomplete solutions, but that might change in future.

  Action: See the solution posted on Moodle and compare it with what you submitted.

  Part (b) also went very well. A few students attempted to check the parity of the function by giving particular numerical values to x and using a hand calculator to confirm that $g(-x) = g(x)$. The following is a verbatim excerpt from the feedback I provided last year (and which has been available on Moodle since the start of the module) *"The parity of a function (even or odd) is a global feature that involves all x-values in the domain of that function. Just picking up a random number, x_0 (say), and showing that $f(-x_0) = f(x_0)$ (or $f(-x_0) = -f(x_0)$) does not prove anything about the parity of $f(x)$. The definitions for even and odd functions are stated in Chapter 1 (slide 12), where it is mentioned that they must hold 'for all x'"*.

  Action: Please read your notes before you attempt the coursework. It is a good idea to make yourself familiar with the feedback from the previous years.

  Part (c) was an unseen question, but some hints were provided about what needed to be done. There were quite a few complete solutions, but also an equally large number of students who simply did not attempt the question. Some noticed that they should take $y = -x$ in the equation provided, but failed to show that $h(0) = 0$.

  Action: See the solution posted on Moodle. Attend the workshops and examples classes. Use my office hours to get help with what you don't understand.

- **Question 3**: Done reasonably well by many (this was similar to the extra question & solution I posted on Moodle when we discussed Chapter 1). Some marks were lost for not labelling the important points on the graph, or for not showing the work for finding the intercepts. Also, in some cases, the quality of the sketch was just terrible.

  Action: See the solution posted on Moodle. Try to pay more attention to the presentation.

Invest in a good plastic ruler.

Part (b) did not cause any major issues, except for a few isolated cases in which the students did not understand what the phrase 'from first principles' meant (there are two examples on the slides posted on Moodle – see Chapter 2). In general the solutions were a bit sloppy, with some writing

$$\lim_{h \to 0} = 3x^2 + 4x \, ;$$

this is not a precise statement because there is no clue as to what is the function whose limit is being calculated. Others calculated the difference quotient, but simply did not write $\lim_{h \to 0}$, while others recorded statements like

$$f'(x) = \lim_{h \to 0} (3x^2 + 4x) \, .$$

Action: Please read the solution posted on Moodle. Study the examples discussed in lectures, as well as those from the examples classes and previous coursework.

- **Question 4**: Part (a) was answered poorly, by expanding both the numerator and the denominator before the quotient rule was applied. It is not wrong, but it leads to more complicated calculations and the final result is no longer in factorised form (marks were lost for failing to state the result in that form). Never expand things when you differentiate, unless there is a clear advantage for doing that. I also felt that some of those applying the chain rule overcomplicated things.

Action: Practice differentiation using the chain rule by working through some of the suggested examples from the recommended textbooks.

Part (*b*) received mixed answers. Some followed the hint I provided and differentiated the given function. Unfortunately, problems were experienced with the application of the chain rule for the $\sin^{-1}$ expression (also, many did not justify why $\sqrt{(x^2 - 1)^2} = x^2 - 1$). Quite a few stated the constant value as $180°$ – please note that in Calculus we work with angles expressed in radians (and the answers typically involve π and various fractional multiples of it). Some students chose not to differentiate and calculated various limits of the function, etc, failing to providing a convincing solution. It is also possible to give a purely trigonometric solution, but in that case more care is required to justify why $x \geq 1$ is needed.

Action: Read the solution on Moodle and compare it with what you submitted. Practice the chain rule and make yourself familiar with the derivatives of the inverse trig functions.

General remark: Please avoid using pencil for official assessment.