Comments on MATH7019 Assignment 2 Submissions

1. Read questions carefully. A number of questions went unanswered: in particular questions that asked for a comment to a graph.

2. A lot of us seem to confuse bending moment with deflection: they are not the same thing. The bending moment I am sure you have heard about since first year. The deflection at x, $y(x)$, is the distance below the neutral at a distance x along the beam. This isn't a maths issue but an engineering issue.

3. Furthermore the maximum deflection does not necessarily occur at the same place as the maximum bending moment.

4. When you are asked to solve a differential equation such as

$$\frac{d^2M}{dx^2} = -w(x),$$

you should present your answer at the end, e.g.

$$M(x) = \frac{1}{5}x^3 - 9x^2 + 40x.$$

You should do this as a habit.

5. The comments I wanted on graphs were along the lines of:

   - Note that the bending moment is maximised where the shear crosses the x-axis, i.e. where shear is equal to zero.
   - (For Simply Supported) Note that the bending moment is zero at the endpoints of the beam.
   - (For Fixed Ends) Note that the bending moment is *not* zero at the endpoints of the beam.
   - Note that the deflection is zero at the end points.

6. A good few students had stuff like:

$$-\frac{13}{EI} = -13EI.$$

This is complete nonsense and shows a complete lack of understanding. I am not sure if everyone understands:

$$\begin{aligned} EI \cdot y(x) &= f(x) \\ \Rightarrow y(x) &= \frac{f(x)}{EI} = \frac{1}{EI} \cdot f(x), \end{aligned}$$

just like:

$$\frac{9}{2} = \frac{1}{2} \cdot 9.$$

7. People had serious issues understanding the geometric/physical/engineering meaning of C_1 and C_2. Please see p.99 of the notes.

8. Explain with the aid of a picture of a loaded cantilever beam, why $y'(x) \leq 0$ implies that the deflection is decreasing in the sense that it is getting 'more negative'.
[2 Marks]

Solution:

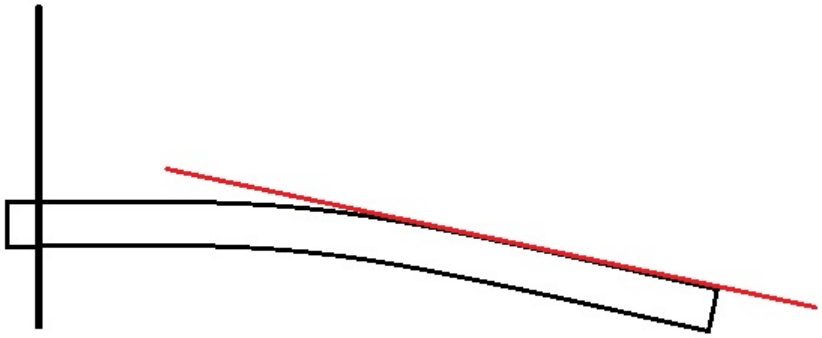

Figure 1: Note that the slope is negative so the deflection is decreasing. Note that the slope is *not* necessarily getting steeper. The slope can be equal to a constant negative value: the slope isn't changing but the deflection is: you *could* say the deflection is increasing *in the negative sense*.

9. As using Excel in Problem 4 gives only an approximate solution, we should have noted that it didn't give the shear equal to zero *exactly* at the midpoint of the beam — but slightly away from the midpoint.

10. Pretty much copying from other people: this is doing you no good at all — in particular when what you are writing down is wrong or makes no sense. Remember that a question that is worth less than 5% in CA could be worth up to 17.5% in the final exam... the assignment gives you an opportunity to increase your understanding and so do well in the exam. If you don't understand what you are writing down then you might well get that 5% but you probably aren't going to get the 17.5%. This is an incredibly short-sighted approach and you may well be found out in the exam.

11. On a slightly related topic, I was delighted to see students research Problem 4 Q.9 and say *Runge-Kutta Methods*. An excellent answer: however why not reference the source? Another answer was that a smaller step-size improves the approximation.