Assignment 4 feedback

General Feedback

The average mark was 14.26 out of 20 (71%) which was pretty good. Though on the other hand only about half of you actually handed in an assignment so if we look at it that way...

More evidence of people turning to the internet to find a solution and then reproducing it for me to mark. I can't be bothered saying anything further about that.

Question 1

Lots of you struggled to explain why k must be positive. The trick with differential equations which model real world situations is to use your intuition about the real world to help you. k being positive is simply saying that if the object is colder than its surroundings then it should heat up and if it's warmer than its surroundings then it should cool down. Some of you thought if k was negative then it would be inverse proportion.

Actually this is not true: remember from GCSE that y is in direct proportion to x if $y = kx$ for some non-zero real number k. Whether k is positive or negative does not matter, this is still direct proportion.

Inverse proportion is when $y = \frac{k}{x}$ for some non-zero real number k.

Some of you ignored the instruction to use minutes as units for t and used hours instead. This meant you got a different value of k. I didn't knock off any marks for this, though in an exam it would cost you...

For the final part, most of you knew it was something to do with changing the temperature so got at least $\frac{1}{2}$ a mark. But a couple of people realised the best thing is to set the thermostat to 37^oC as this renders it completely impossible for the coroner to use cooling as a method to estimate time of death. If anyone had gone a step further and pointed out that this temperature is a *stable equilibrium point* of the differential equation I'd have given a bonus mark, but no-one did.

Question 2

A common error here was to write $h(x) = f(g(x))$, which is correct, but then to say $h(-x) = f(-g(-x))$ with that extra minus sign between the f and the g. Remember that once we define $h(x)$ as being $f(g(x))$, when we then pass a value to the x variable in the $h()$ function we only get to put that value exactly where the letter x occurs in the definition of $h()$. By putting an extra minus sign in you're effectively changing your definition of $h()$.

Lots of people used the chain rule for part (a)(iii). Actually I hadn't even thought of that and my intention was for you to think about the limits involved but of course the chain rule is a slick and valid way to get the result. You lost marks if you didn't *tell* me that's how you were doing it.

For part (b) some of you proved something different than was asked and, judging by the coincidental use of the same letters, I guess were copying from the same website. Relatively few actually showed that $h_e()$ and $h_o()$ were even and odd respectively. For the last part people lost marks by giving an example but not showing that it was neither odd nor even before showing it was a sum of the even and odd parts.

Question 3

This question was reasonably well done, though quite a few people don't understand what the phrase "released from rest" means: it only means that the *initial velocity* is zero. It does not say anything about initial displacement or acceleration.

The phrase "long term behaviour" of the system confused some people also. It means you are to explain what happens as $t \to \infty$ for *all the quantities you have solved for.* So for this problem that means what happens to $x(t), \dot{x}(t)$ and $\ddot{x}(t)$ as $t \to \infty$.

Question 4

Most people were fine with this question. Those who weren't were trying to do the right thing but got mixed up with the logic of building up the table. We had a few show-offs who programmed in python to solve the problem (python $\neq$ excel) but good for you, you got it right. As I've already said there won't be a question like this on the exam as it's the kind of thing that can turn into a nightmare under pressure.