Science School of Mathematics and Statistics

New Tutor Demonstration

The School of Mathematics and Statistics takes the teaching of first year students very seriously. For many students, the tutorial is their ‘life-line' and it is very important that our tutorials are of a high standard.

With this in mind, we require that everyone applying to tutor in First Year Mathematics who has not been previously employed by us, should give a short demonstration tutorial to a couple of experienced staff members.

This ‘demonstration' consists of presenting, as if to a class, two problems: one in Algebra and one in Calculus, selected by you from a list of 12 questions given on the next page. These questions are the normal types of problems a tutor would be expected to explain to a MATH1131 class. You

You should see the demonstration tutorial not just as a
but also as a means of getting useful feedback and
necessarily looking for ‘expert' teachers, but rather for p
techniques and a willingness to adapt, learn and develo

Although the demonstration tutorial is somewhat artif
students, you should try to think of the (small) audienc
that is, assume that they do not already know the mater
students.

All part-time tutors will need to attend a briefing on
information on administrative matters, and all new tuto
matters relating specifically to teaching. There will be o
a visit to your tutorial by an experienced member
encouragement.

Jonathan Kress
Director of First Year Studies
School of Mathematics and Statistics

LIST OF QUESTIONS:

You should select ONE of the following CALCULUS questions:

1. Discuss the behaviour of $f(x) = \frac{|x^2 - 4|}{x - 2}$ as $x \to 2^+$, $x \to 2^-$ and $x \to 2$.
2. Find the limit as $x \to 1$ for $f(x) = \dfrac{5x^2 - 3x + \cos 7x}{4 + \sin 2x + x^2}$.
3. For each $\varepsilon > 0$, find an M such that for all $x > M$, $\frac{x^2+1}{x^2}$ is within ε of its limit as $x \to 1$.
4. Use the mean value theorem to show that $\ln(1 + x) < x$ for $x > 0$.
5. Find
$$\lim_{x \to 1} \frac{\ln(x^3 + 1)}{\ln(x^2 + 1)}.$$
6. If
$$y = \int_x^{x^3} \sin(t^2)\, dt$$
find $\frac{dy}{dx}$.

You should select ONE of the following ALGEBRA questions.

1. Find the polar form for $z = \sqrt{3} - i$ and hence find the '$a + ib$' form for z^7.
2. Use the method of complex numbers to express $\cos^4 \theta$ in terms of cosines of multiples of θ.
3. Find all the solutions of $x^6 = 64$ and hence write $x^6 - 64$ as a product of linear factors, and as a product of linear and quadratic factors with real coefficients.
4. Find the parametric vector form of the line through $\begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix}$ parallel to the line joining the points $\begin{pmatrix} 2 \\ 2 \\ 1 \end{pmatrix}$ and $\begin{pmatrix} 7 \\ 1 \\ 3 \end{pmatrix}$.
5. Is the vector $\begin{pmatrix} 1 \\ 3 \\ 2 \end{pmatrix}$ in span $\left\{ \begin{pmatrix} 0 \\ 2 \\ 1 \end{pmatrix}, \begin{pmatrix} 1 \\ 3 \\ 4 \end{pmatrix} \right\}$?
6. Find the projection of the vector $\begin{pmatrix} 2 \\ 1 \\ 3 \end{pmatrix}$ onto a vector normal to the plane
$$2x_1 + 2x_2 - 3x_3 = 4.$$