Exercise Sheet 3

Hand in your work by 23 October.

1. (Warm-up question*) Consider the function f with $f(x) = x^3$. Find the derivative $f'(x)$ from first principles, i.e., by finding the limit of the difference quotient.

2. Find the limit
$$\lim_{x\to\infty} \frac{2x^3 - x + 7}{x^3 + x^2 + 100}.$$

3. Find the following limits.

   (a) $\lim_{x\to\infty} \dfrac{x^2 + 6x - 7}{3x^2 + 10}$

   (b) $\lim_{x\to 2} \sin\left(e^{2-x}\pi\right)$

4. Find $\sqrt{3}$ with the bisection method to 3 significant figures (i.e., with sufficient accuracy to ensure that the first 3 digits in the decimal representation are correct after appropriate rounding). Start with the interval $1 \le x \le 2$.

5. Differentiate the functions given by the following formulas.

   (a) $y = x^6(\sin x + \cos x)$

   (b) $y = \cot x$

Solutions will be available after the hand-in date at:
`http://people.bath.ac.uk/rm257/MA10192/`

RM, 06/10/2017

*Do not hand in your work for this question.