MATH 1115, Mathematics for Commerce
WINTER 2011
Toby Kenney
Homework Sheet 7
Due: Wednesday 23rd March: 2:30 PM

Each multiple choice question is worth one mark, other questions are worth two marks. Show your working for the other questions, but for multiple choice questions, just the letter is sufficient.

1. Calculate $\lim_{x\to 2} x^2+7$.
   (A) 7
   (B) 9
   (C) 11
   (D) ∞
   (E) The limit does not exist and is not ∞
2. Calculate $\lim_{x\to 2} \frac{(x-2)^3(x+3)(x-5)}{(x-2)^2(x+6)}$.
   (A) $-\frac{15}{8}$
   (B) 0
   (C) 15
   (D) ∞
   (E) The limit does not exist and is not ∞
3. Calculate $\lim_{x\to\infty} \frac{3x^3+2x^2-4x+1}{2x^3-4x^2+3x-7}$
   (A) $-\frac{1}{2}$
   (B) 0
   (C) $\frac{3}{2}$
   (D) ∞
   (E) The limit does not exist and is not ∞
4. Which of the following functions is continuous at $x=3$?
   (A) $f(x)=\begin{cases} x^2-4 & \text{if } x\leqslant 3 \\ x+2 & \text{if } x>3 \end{cases}$
   (B) $f(x)=\frac{x^3+7}{x-3}$
   (C) $f(x)=\begin{cases} x-2 & \text{if } x\leqslant 3 \\ x+2 & \text{if } x>3 \end{cases}$

(D) $f(x) = \begin{cases} x^2 - 2 & \text{if } x < 3 \\ 6 & \text{if } x = 3 \\ x + 4 & \text{if } x > 3 \end{cases}$

(E) More than one of them is continuous at $x = 3$.

5. Define $f(x)$ to be the fractional part of x, that is, the smallest non-negative number such that $x - f(x)$ is an integer $\{\ldots, -2, -1, 0, 1, 2, \ldots\}$. For example, $f(3) = 0$, $f(4.6) = 0.6$, $f(-2.4) = 0.6$.

   Calculate $\lim_{x\to\infty} f(x)$.

   (A) 0

   (B) $\frac{1}{2}$

   (C) 1

   (D) ∞

   (E) The limit does not exist and is not ∞

6. The function $f(x) = \begin{cases} \frac{x^2-2}{(x-2)(x-4)} & \text{if } x \leqslant 3 \\ \frac{x+4}{x-1} & \text{if } x > 3 \end{cases}$ is continuous:

   (A) everywhere.

   (B) everywhere except at $x = 3$.

   (C) everywhere except at $x = 2$.

   (D) everywhere except at $x = 2$, $x = 3$, $x = 4$.

   (E) everywhere except at $x = 2$ and $x = 3$.

7. Solve $(x^2 + 4)(x - 3)(x + 2)^3(x - 2) \leqslant 0$.

8. Give an example of two functions f and g such that $\lim_{x\to 2} f(x)$ and $\lim_{x\to 2} g(x)$ do not exist, but such that $\lim_{x\to 2} f(x) + g(x)$ exists.