MAST10006 Calculus 2, Semester 2, 2020

Assignment 1

School of Mathematics and Statistics, The University of Melbourne

- Submit your assignment solutions online in Canvas before **6pm, Monday 24 August 2020**
- Submit your solutions as a single PDF file with the pages in the right order and correct orientation. You may be penalised a mark if you do not.
- This assignment is worth 2.22% of your final MAST10006 mark.
- Answer all questions below. Of these questions, one will be chosen for marking.
- Marks may be awarded for:
  - Correct use of appropriate mathematical techniques
  - Accuracy and validity of any calculations or algebraic manipulations
  - Clear justification or explanation of techniques and rules used
  - Use of correct mathematical notation and terminology
- You must explicitly state if you use the Sandwich Theorem, l'Hôpital's Rule, limit laws, continuity or standard limits in your answers when evaluating limits.
- You must use methods taught in MAST10006 Calculus 2 to solve the assignment questions.

1. (a) Evaluate the limit

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

or explain why it does not exist.

(b) For which value of a is the function defined by the rule

$$f(x) = \begin{cases} \frac{e^x - e^\pi}{\cos\left(\frac{x}{2}\right)} & x < \pi \\ a \sin\left(\frac{\pi^2}{2x}\right) & x \geq \pi \end{cases}$$

continuous? Explain why the function is continuous for your answer with reference to the definition of continuity.

2. Evaluate the following limits of sequences, or explain why they do not exist:

(a) $\displaystyle\lim_{n \to \infty} \frac{n \log\left(\cos^2(n) + 3\right)}{2020^n}$

(b) $\displaystyle\lim_{n \to \infty} \sin\left(\frac{(2n-1)\pi}{4}\right)$

(c) $\displaystyle\lim_{n \to \infty} \tan\left((2020n)^{\frac{1}{n}}\right)$

End of assignment