

**MATH 2060B - HW 2**  
**Due Date:** 3 Feb 2021, 23:59

**Problems:** Ex6.2 P.179: 5, 14; Ex6.4 P.196: 4 (3 Questions in total)

**Textbook:** Bartle RG, Sherbert DR(2011). Introduction to Real Analysis, fourth edition, John Wiley Sons,Inc.

**Instruction:**

1. Please submit your solution in one pdf file to Blackboard.
2. Rename your file in the form "HW1-ChanTaiMan\_1155151031".
3. You are reminded that your HW is graded based on **both** your idea and your presentation

**Questions:**

**1** (P.179 Q5). Let  $a > b > 0$  and let  $n \in \mathbb{N}$  satisfy  $n \geq 2$ . Show that  $a^{1/n} - b^{1/n} < (a - b)^{1/n}$ .  
(If you have spent enough efforts but without progress, you may consult the hint in the footnote<sup>1</sup>.)

**2** (P.179 Q14). Let  $I$  be an interval and let  $f : I \rightarrow \mathbb{R}$  be differentiable on  $I$ . Suppose  $f'$  is never 0 on  $I$ . Show that either  $f'(x) > 0$  for all  $x \in I$  or  $f'(x) < 0$  for all  $x \in I$ .

**3** (P.196 Q4). Let  $x > 0$ . Show that

$$1 + \frac{1}{2}x - \frac{1}{8}x^2 \leq \sqrt{1+x} \leq 1 + \frac{1}{2}x$$

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<sup>1</sup>Hint: Consider  $f(x) := x^{1/n} - (x-1)^{1/n}$ . Show that  $f$  is decreasing for  $x \geq 1$  and evaluate  $f$  at 1 and  $a/b$