

MA 1201 Semester B 2020/21

Assignment 2 — Due at 11:59 pm, 18/3/2021 (Thursday) online on Canvas

Instructions:

- Please show your work. Unsupported answers will receive **NO** credits.
 - Make sure you write down the correct lecture session (A/B/C/D/E/F/G/H) you have registered for, together with your full name and student ID on the front page of your answer script. Scan your solution into a single pdf file and upload it to Canvas.
 - **NO** late homework will be accepted. Homework submitted to wrong tutorial sessions will **NOT** be graded and will receive **0 POINTS**.
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1. (50 points) Evaluate the following integrals.

(a) (10 points) $\int \frac{\tan^{-1} \sqrt{x}}{\sqrt{x}(1+x)} dx.$

(b) (10 points) $\int_{\ln 2}^{\ln 3} \frac{dx}{e^x - e^{-x}}.$

(c) (15 points) Find the induction formula of the integration $I_n = \int \frac{x^n}{\sqrt{1-x^2}} dx.$

(d) (15 points) $\int \frac{3x^2 + 3x - 1}{(x-1)(x^2 + 2x + 2)} dx.$

2. (15 points) Find the volume of the solid generated by revolving the region bounded by the curves $y = \sin x$, $y = 0$, $0 \leq x \leq \pi$,

- (a) (5 points) about the x -axis.
 - (b) (5 points) about the y -axis.
 - (c) (5 points) about the line $x = 2\pi$.
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3. (20 points) Let S_1 be the area of the region bounded by the curve $y = x^2$ and the lines $y = ax$, ($0 < a < 1$), and let S_2 be the area of the region bounded by the curve $y = x^2$, the lines $y = ax$, ($0 < a < 1$) and the line $x = 1$, where a is the same constant.

- (a) (10 points) Find the value of a that minimizes the value of $S_1 + S_2$. What is the minimum value?
 - (b) (10 points) Find the volume of the solid generated by revolving the region, that takes the minimum value of $S_1 + S_2$, about the x -axis.
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4. (15 points) Find the length of the curve $y = \ln \cos x$, $0 \leq x \leq a < \frac{\pi}{2}$, where a is a constant.

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