



Department of Mathematics and Natural Sciences

MAT 110

## ASSIGNMENT 2

SUMMER 2021

SET: 17 (AII)

*Please write your name and ID on the first page of the assignment answer script - you have to do this for both handwritten or L<sup>A</sup>T<sub>E</sub>X submission. The last date of submission is 17-7-2021, 1159 pm. Solve all problems.*

*You can only submit a PDF file - image or doc files won't be accepted. Before submitting the PDF, please rename the PDF file in the format - SET\_ID\_SECTION.*

*Answer the questions by yourself. Plagiarism will lead to an F grade in the course. **Total marks is 300. Each question is worth 50 marks.** If you do your work using L<sup>A</sup>T<sub>E</sub>X you will get a mark which will be added as a L<sup>A</sup>T<sub>E</sub>Xbonus to your course grade.*

*If you use L<sup>A</sup>T<sub>E</sub>X, you must add a screenshot of the raw code and compiled pdf side by side, in order to earn your bonus.*

*This set was prepared by AII. If you have any questions, please text AII on Slack.*

1. Find  $\frac{dy}{dx}$  of  $y = \tan^{-1}(\sin(\ln(x^3)))$  at  $x = 1$ .
2. Suppose  $y = (\cos x)^{\sin x} + (\sin x)^{\cos x}$ , then find  $\frac{dy}{dx}$ .
3. If  $x = a \sin^3 \theta$ ,  $y = a \tan^2 \theta$ , where  $a \neq 0$ , find  $\frac{dy}{dx}$ .
4. For the function  $y = 2e^x \sin x$ , use Leibniz product rule to evaluate  $\frac{d^4 y}{dx^4}$ .

5. Determine the intervals where  $f(x) = 2x^4 - 16x^2 + 32$  is **(i)** decreasing, **(ii)** increasing, **(iii)** concave down and **(iv)** concave up. Also find the inflection points (if any).
6. Locate all the critical numbers for  $f(x) = x^2(x - 1)^{\frac{2}{3}}$  and identify which critical numbers correspond to the stationary points. Also find the stationary points (if any).