

Mathematical Methods - Analysis

Assignment 3

Due: 25 September 2023

1. For each of the following functions decide if they are increasing, decreasing or neither, find (local) extrema and inflection points, if they exist in the given intervals; provide a brief justification. Finally, sketch the graph of each function. [60 points]

(a) $f(x) = \frac{x}{1+x^2}, \quad -8 < x < 8.$

(b) $f(x) = \frac{2+x^2}{x^3-x} \quad -2 < x < 2.$

(c) $f(x) = x \ln(x^2) \quad -2 < x < 2.$

(d) $g(x) = \frac{1}{1+x^4} \quad -2 < x < 2.$

(e) $g(x) = xe^{\sin(\pi x)} \quad -\pi < x < \pi.$

(f) $e^{-x} \sin(x) \quad -\pi < x < \pi$

2. Consider the following real valued function [5 points]

$$f(t) = Ce^{kt},$$

where C, k are fixed nonzero constants. If $k > 0$ then find T such that $f(t+T) = 2f(t)$.
If $k < 0$ then find T such that $f(t+T) = 0.5f(t)$.