

ASSIGNMENT 17

More practice for Exam 2

Exercise 17.1. Consider the function $f(x) = \frac{x}{1+x^2}$.

- (1) Find the roots, critical points, and inflection points of f .
- (2) On what intervals is f increasing/decreasing?
- (3) On what intervals is f concave up/down?
- (4) Compute $\lim_{x \rightarrow \infty} f(x)$ and $\lim_{x \rightarrow -\infty} f(x)$.
- (5) Sketch the graph of f .

Exercise 17.2. Repeat the previous problem for the function $f(x) = \tan^{-1} x$.

Exercise 17.3. Suppose we want to make a cardboard box with a square base, rectangular walls, but no lid. We require that the volume of the box be 100. Find the width of the base and height of the box that is made using the least amount of material.

Exercise 17.4. Suppose that a particle travels along the parabola $y = x^2 - 2x + 5$. At what point along the parabola is the particle closest to the origin $(0, 0)$?

Exercise 17.5. Compute the following derivatives:

- (1) $\frac{d}{dx} [e^{-x^2}]$
- (2) $\frac{d}{dx} [e^{-x^2} \sin x]$
- (3) $\frac{d}{dx} [e^{-x^2} \sin^{-1} x]$
- (4) $\frac{d}{dx} [\sin(e^{-x^2})]$