Ex. 1 Compare the domains and ranges of the functions $f(x) = \dfrac{x}{x}$ and $g(x) = \sin^2 x + \cos^2 x$. Are they equal? Explain your answer.

Ex. 2 Write down The Sandwich Theorem for Sequences. Find the limit of $a_n = \sqrt[n]{e^n + \pi^n}$.

Ex. 3 Find all points of discontinuity of the function defined by $f(x) = \begin{cases} \operatorname{arctg} \dfrac{1}{x} & x < 0 \\ 1 & x = 0 \\ \operatorname{arctg} \dfrac{1}{x} & 0 < x \end{cases}$.

Ex. 4 Find local extremum values of $f(x) = x - \ln(x+1)$.

Ex. 5

a) Find the indefinite integral $\int \arctan x \, dx$.

b)* Evaluate the integral $\int_0^2 \sqrt{1 - x^2} \, dx$ by interpreting it in terms of area.