LIST 2. Graphing of Functions.

Task 1: Find the intervals of monotonicity of the function f:

a. $f(x) = 4x + \dfrac{1}{x}$; b. $f(x) = xe^{-3x}$; c. $f(x) = \dfrac{x^3}{3-x^2}$; d. $f(x) = \dfrac{\sqrt{x^2-1}}{x}$.

Task 2: Find the local extremes of the function f:

a. $f(x) = \dfrac{2^x}{x}$; b. $f(x) = (x+1)e^{-x}$; c. $f(x) = \dfrac{x+1}{x^2+1}$; d. $f(x) = x\ln x$.

Task 3: Find the largest and smallest values of the function f within the given intervals:

a. $f(x) = e^{2x-x^2}$, $\left\langle 1 - \dfrac{\sqrt{2}}{2}, 2 \right\rangle$; b. $f(x) = \arctan\dfrac{1-x}{1+x}$, $\langle 0;1 \rangle$.

Task 4: Find the intervals of convexity and inflection points of the function f:

a. $f(x) = \dfrac{1}{1-x^2}$; b. $f(x) = \ln(1+x^2)$; c. $f(x) = \sin x + \dfrac{1}{8}\sin 2x$; d. $f(x) = e^{\arctan x}$.

Task 5: Construct the plot of the function:

a. $f(x) = \dfrac{x^3}{x^2-2}$; b. $f(x) = \sqrt{x}\ln x$; c. $f(x) = \dfrac{x^3+1}{x^3-1}$; d. $f(x) = \dfrac{x^2}{2} + \dfrac{1}{x}$;

e. $f(x) = \dfrac{\sqrt{x}}{x-1}$; f. $f(x) = x\sqrt{1-x^2}$; g. $f(x) = \dfrac{x}{\ln x}$; h. $f(x) = xe^{2x}$.