LIST 5. Improper Integrals.

Task 1: Calculate improper integrals type 1 (if they are convergent):

a) $\int_1^{+\infty} \frac{dx}{x^2(x+1)}$; *b)* $\int_{-\infty}^{+\infty} \frac{dx}{3x^2+12x+24}$; *c)* $\int_0^{+\infty} \frac{dx}{x^3+1}$;

d) $\int_1^{+\infty} \frac{\arctan x}{x^2} dx$; *e)* $\int_0^{+\infty} e^{-x} \sin x dx$; *f)* $\int_0^{+\infty} x \sin x dx$.

Task 2: Calculate improper integrals type 2 (if they are convergent):

a) $\int_0^1 x \ln x dx$; *b)* $\int_1^e \frac{dx}{x \ln x}$; *c)* $\int_1^2 \frac{dx}{\sqrt{x-1}}$;

d) $\int_1^e \frac{dx}{\sin x}$; *e)* $\int_1^2 \frac{dx}{\sqrt{(x-1)(2-x)}}$; *f)* $\int_0^2 \frac{dx}{\sqrt[3]{(x-1)^2}}$.

Task 3: Calculate area of the surface limited by axes of coordinate system and the graph of the function $y = e^{-2x}$, for $x > 0$

Task 4: Calculate the volume of solid of revolution formed by rotation of graph of the function below (around the x-axis):

$y = \frac{1}{x}$, for $x \geq 1$.