

Applied analysis

Exercise sheet 11

Exercise 39. Determine the intervals of continuity and the intervals of differentiability for the following functions (in variable a). Compute the derivative!

$$(a) \int_0^{\infty} x^{a-1} e^{-x} dx$$

$$(b) \int_0^{\infty} \frac{\sin ax}{1+x^2} dx$$

$$(c) \int_0^{\infty} \frac{\sin x}{1+ax^2} dx$$

$$(d) \int_0^{\infty} \frac{x^a}{1+x^2} dx$$

$$(e) \int_0^{\infty} \frac{x}{e^{-ax} - 1} dx$$

$$(f) \int_0^{\pi} \frac{\log(1+a \sin x)}{x} dx$$

$$(g) \int_0^1 \frac{1-x^a}{\log x} dx$$

(each 3 points)