

Problem Sheet 3 for 6401

Due Thursday 27 October 2011, at the Problem Class. You should hand in solutions to all problems, but only some of them will be marked. The deadline for handing in your work is 11.55 am.

1. For the following functions, find the critical values and local extrema (maxima or minima). Describe the intervals in which f is increasing or decreasing and sketch the graph of f .

(a) $f(x) = x^{1/3}(x^3 + x^2 - x)$;

(b) $f(x) = x^2(x^2 - 4)^{1/3}$;

(c) $f(x) = (x + 1)e^{x^2 - x}$.

2. Find the following indefinite integrals:

(a) $\int e^{2x} dx$;

(b) $\int (x^5 - 17x^3) dx$;

(c) $\int \cos^3 x \sin x dx$.

3. We define

$$\int_1^\infty x^{-a} dx = \lim_{X \rightarrow \infty} \int_1^X x^{-a} dx,$$

if the limit in the right-hand side exists (and is finite). Find for which a this integral exists and compute it.