

Exam test D

for Mathematics 1, WS 2017/18

1. (15 points) Compute the limit

$$\lim_{x \rightarrow 2} \frac{x^2 + 5}{\sqrt{x+6} - \sqrt{x^3}} (\log(x^2) - \log(2x)).$$

2. (20 points) Investigate the function

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

(find local extrema, intervals of monotonicity, convexity, inflections, limits in endpoints of D_f , asymptotes and draw graph of f).

Hint: Insert $x = 1$ into f'' .

3. (15 points) Investigate the function

$$g(x) = \frac{1}{4} [x^2 + 1] \sin(\pi x^2 + \sin(\pi x))$$

in a neighborhood of 1 (compute the limits of $g(x)$ and $g'(x)$ as $x \rightarrow 1+$, $x \rightarrow 1-$, decide, whether g is continuous at 1, and draw graph of g in a neighborhood of 1) and compute $g'_+(1)$, $g'_-(1)$.