# Exam test A

## Mathematics 1, WS 2017/18

**1.** (15 points) Compute the limit

$$\lim_{x\to 1}\left(\frac{1+x^2}{4-2x}\right)^{\frac{x}{\sin(\pi x)}}.$$

**2.** (20 points) Investigate the function

$$f(x) = x^2 + \log(2+x)$$

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

**3.** (15 points) Investigate the function

$$g(x) = 2x^2 \operatorname{tg} x \operatorname{sgn}(\sin x - \tfrac{\sqrt{2}}{2})$$

in a neighborhood of $\frac{\pi}{4}$ (compute the limits of $g(x)$ and $g'(x)$ as $x \to \frac{\pi}{4}+$, $x \to \frac{\pi}{4}-$, decide, whether $g$ is continuous at $\frac{\pi}{4}$, and draw graph of $g$ in a neighborhood of $\frac{\pi}{4}$) and compute $g'_+(\frac{\pi}{4})$, $g'_-(\frac{\pi}{4})$.