# Numerical Algorithms

Winter semester 2013/2014
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## Exercise Sheet 9.

Due date: **Tuesday, 21 January**.

**Exercise 12.** Show that the sufficient decrease conditions,

$$\|f(x + \Delta x)\| \le \|f(x) + c_1 \, (D_x f) \, \Delta x\|, \tag{2.2.28}$$

$$g(x + \Delta x) \le g(x) + c_1(D_x g)\Delta x, \tag{2.2.30}$$

with $0 < c_1 \ll 1$, $f = D_x g$, are affine invariant.

(5 points)

**Exercise 13.** For $u : \Omega \to \mathbb{R}$, $g : \mathbb{R} \to \mathbb{R}$ continuously differentiable, derive formally that for the composition $g \circ u$ we have

$$D_u g = g' \circ u \in \mathbb{R}. \tag{2}$$

(5 points)