

Self-assessment test #3  
1TD254: Finite element methods II, 5.0 hp

*Præparatus supervivet*

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1. **True/False:** Suppose  $u \perp v$ . Then

$$\|u + v\|^2 = \|u\|^2 + \|v\|^2.$$

2. **True/False:** Robin boundary conditions include both Dirichlet and Neumann conditions as special cases.

3. **True/False:** The function

$$f(x) = \begin{cases} 1 & \text{for } x \geq 1 \\ 0 & \text{for } x < 1 \end{cases}$$

has a weak derivative.

4. **True/False:** If  $a(u, v)$  is a linear elliptic operator Newton-Galerkin's method converges in one iteration.

5. **True/False:** If  $a(\cdot, \cdot)$  is elliptic, then

$$(u, v) \mapsto a(u, v) + c,$$

with  $c \in \mathbb{R}$  arbitrary, is also elliptic.

6. **True/False:** If  $a(\cdot, \cdot)$  and  $l(\cdot)$  satisfy Lax-Milgram, then

$$F(v) = \frac{1}{2}a(v, v) - l(v)$$

defines a bounded linear form.

7. **True/False:** The iteration  $x_{k+1} = x_k^2$  is contractive fix-point iteration.

8. **True/False:** The following problem

$$\begin{aligned}u_x &= 1, & x &\in (0, 1), \\u(0) &= u_x(1) = 1,\end{aligned}$$

is well-posed.

9. **True/False:** The following problem

$$\begin{aligned}u_x &= 1, & x &\in (0, 1), \\u(0) &= u(1) = 0,\end{aligned}$$

is well-posed.