1. True/False: The following problem

\[-u'' = f, \quad x \in I = (0,1),\]

\[u(0) = u(1) = 0,\]

is well-posed.

2. True/False: The orthogonal projection \(P_h\) onto the space \(V_h\), is the minimizer \(f^*\) of \(\|f - f^*\|_{L^2}\).

3. True/False: Let \(f(x) = (x-1)(x+1)\). Then according to the midpoint rule,

\[\int_{-1}^{1} f(x) \, dx \approx -1.\]

4. True/False: Let \(I = (0,1)\). Then

\[\int_I uv + u_x v_x \, dx \leq \left( \| u \|_{L^2(I)}^2 + \| u_x \|_{L^2(I)}^2 \right)^{1/2} \left( \| v \|_{L^2(I)}^2 + \| v_x \|_{L^2(I)}^2 \right)^{1/2}.\]

5. True/False: For the orthogonal projection \(P_h\) onto the space \(V_h\),

\[P_h^2 f = P_h f.\]
6. **True/False:** Let $u, u_x \in L^2(I), I = (0,1)$. Suppose that $u(0) = 0$. Then

$$\|u\|_{L^2(I)} \leq \|u_x\|_{L^2(I)}.$$ 

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

$$u_t = -u_{xx} + f, \quad x \in I = (0,1),$$

$$u(t,0) = u_0(x),$$

$$u(t,1) = u(t,1) = 0,$$

is well-posed.

8. **True/False:**

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

9. **True/False:** *A priori* error estimates are difficult to use for mesh adaptivity.

10. **True/False:** The bilinear form

$$a(u,v) := \int_{\Omega} \nabla u \cdot \nabla v \, dx$$

defines a scalar product on $V = \{v; \|v\|_{L^2(\Omega)} + \|\nabla v\|_{L^2(\Omega)} < \infty\}$. 