

Solutions to Homework Exercises in Chapter 18

EXERCISE 18.1

EXERCISE 18.2

$$N_1^e = -\frac{1}{8} (1 - \eta) \eta (1 - \mu) (1 - \xi) \xi$$

$$N_9^e = -\frac{1}{4} (1 - \eta) \eta (1 - \mu) (1 - \xi) (1 + \xi)$$

$$N_{17}^e = \frac{1}{2} (1 - \eta) (1 + \eta) (1 - \mu) (1 - \xi) (1 + \xi)$$

EXERCISE 18.3

- (a) For 20-node, $3 \times 3 \times 3$ rule since $3^3 \times 6 = 162 > 20 \times 3 - 6 = 54$.
- (b) For 27-node, $3 \times 3 \times 3$ rule since $3^3 \times 6 = 162 > 27 \times 3 - 6 = 82$.
- (c) For 16-node, $2 \times 2 \times 2$ rule since $2^3 \times 6 = 48 > 16 \times 3 - 6 = 42$.
- (d) For 18-node, $2 \times 2 \times 2$ rule since $2^3 \times 6 = 48 \geq 18 \times 3 - 6 = 48$.

For the last two, using less Gauss points in the μ direction:

- (e) For 16-node, $3 \times 3 \times 1$ rule since $3^2 \times 6 = 54 > 16 \times 3 - 6 = 42$.
- (f) For 18-node, $3 \times 3 \times 1$ rule since $3^2 \times 6 = 54 > 18 \times 3 - 6 = 48$.