

Figure 1. Quadrilateral (a) and collapsed quadrilateral (b) quarter-point elements.

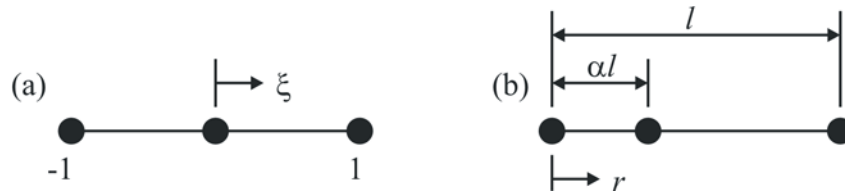


Figure 2. A 1-D quadratic element, (a) the parametric space of the element, (b) the Cartesian space of the element.

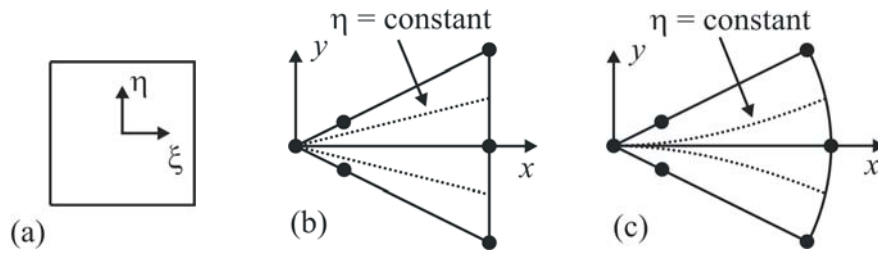


Figure 3. (a) the parametric space of a quadrilateral element, (b) and (c) the mapping of constant η lines in the Cartesian space for different far side node placements for collapsed quadrilateral quarter-point elements.

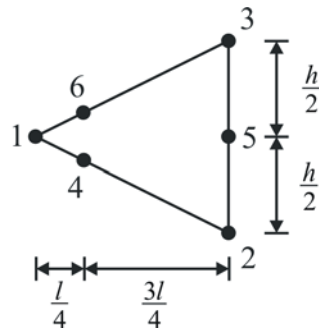


Figure 4. The natural triangle quarter-point element.

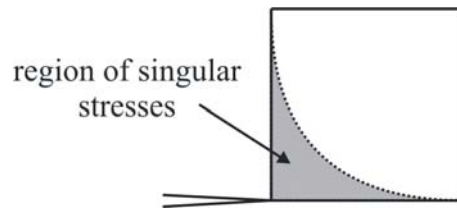


Figure 5. A schematic of the neighborhood where square root singularity is modeled in quadrilateral quarter-point elements.

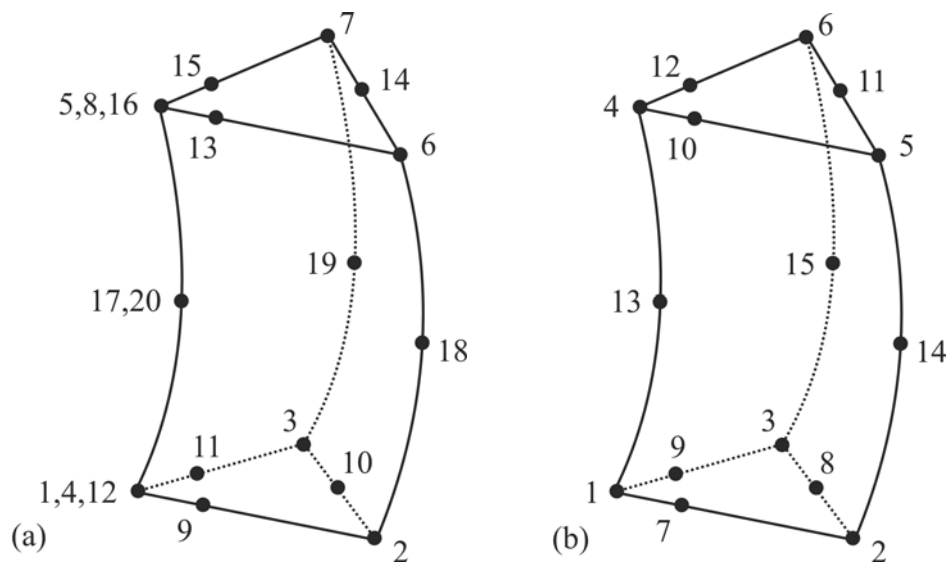


Figure 6. The collapsed, 20-noded brick, quarter-point element (a) and (b) the natural, 15-noded, wedge quarter-point element.

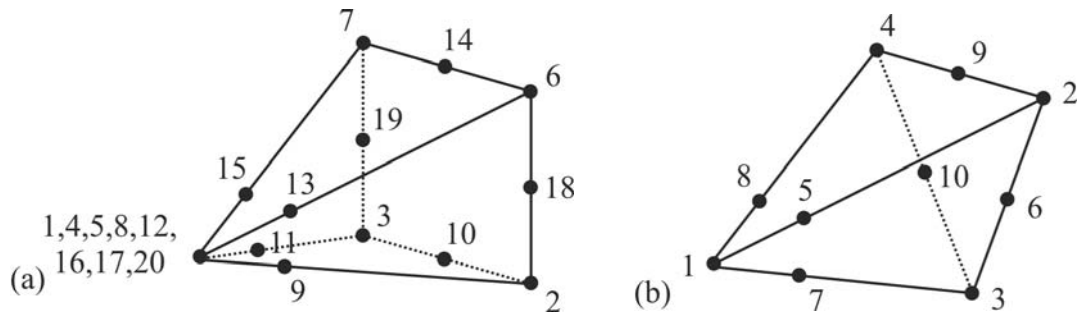


Figure 7. The collapsed, 20-noded brick, pyramid quarter-point element (a) and (b) the natural, 10-noded tetrahedral, quarter-point element.

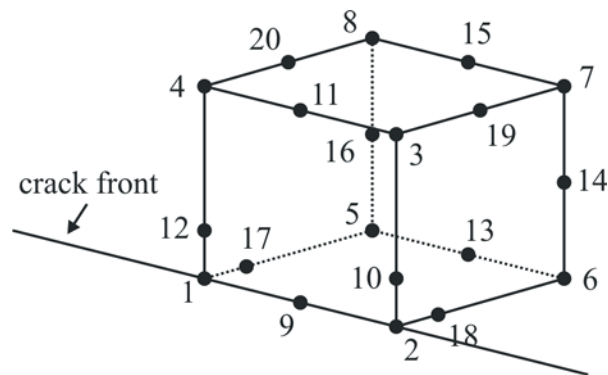


Figure 8. The 20-noded brick quarter-point element.

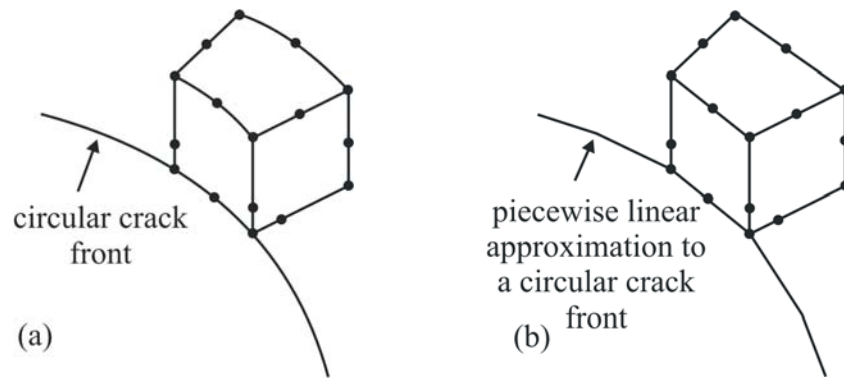


Figure 9. (a) A 20-noded quarter-point element with circular arc edges on and parallel to the crack front, and (b) a trapezoidal element that approximates the circular front.

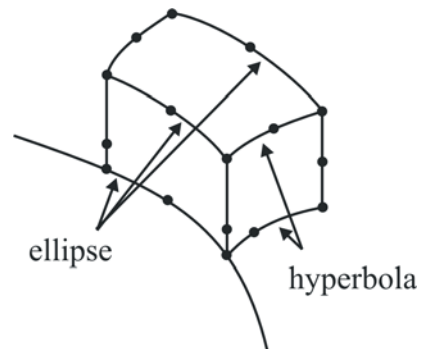


Figure 10. An ellipse/hyperbola, 20-noded quarter-point element for modeling elliptical crack fronts.