2.2 Linear algebra

Name: _____ Class: _____ Date: _____ **Total: 14 marks**

KEY WORDS condition number • eigenvalue

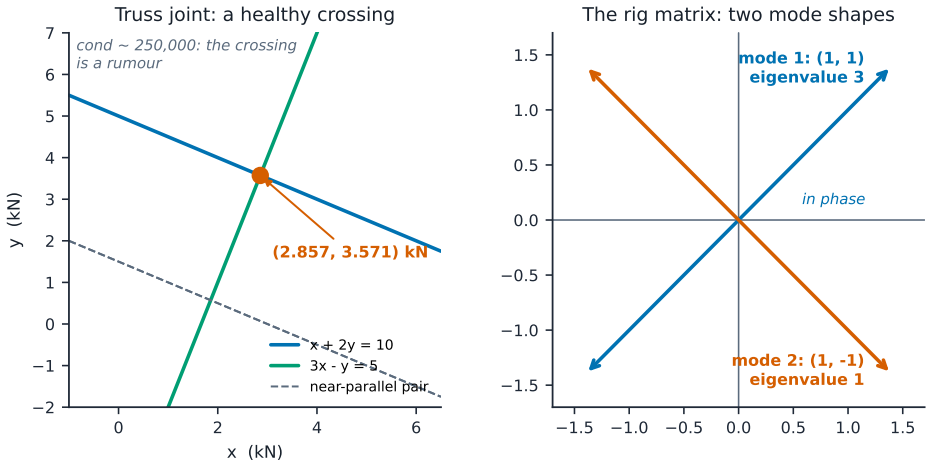
Objective

Solve small systems, interpret conditioning, and use eigenvalues for mode shapes.

1 Key knowledge and worked examples

■ Intersections, modes, conditioning

One intersection per system; eigen-directions of a symmetric matrix are orthogonal; the condition number prices how input noise reaches the answer.



Shallow crossings are rumours

■ Worked example. The rig

Joint (2.857, 3.571) kN; eigenvalues 3 and 1 with modes (1,1), (1,-1); condition numbers 3 against ~250,000 ✓.

2 Practice

2.1 Solve $2x + 3y = 12$, $x - y = 1$ and verify both equations. [3]

2.2 The matrix with rows (4, 1) and (1, 4): its eigenvalues and eigenvectors. [4]

2.3 The matrix with rows (1, 1) and (1, 1.0001): the condition number (nearest thousand), and what it says about the solved answer. [3]

2.4 An initial displacement (2, 0) of the two-mass rig of 2.2. Express it in the mode basis and state each mode's share. [4]