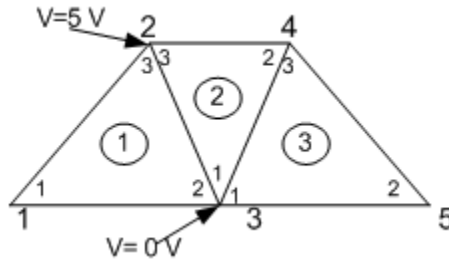


Fall 2005:

Problem 5:



The solution region shown above consists of the three elements. Node 2 is held at 5V while node 3 is held at 0V. The nodes, elements, and nodes within each and are shown. Determine the following

- (1) Dimension of the global coefficient matrix (size): (2)
- (2) Write the general form of the global coefficient matrix (all elements)? (5)
- (3) What will be the simplified global coefficient matrix (non-zero elements only) State why elements are zeros? (13)
- (4) Express the non-zero elements of the global matrix coefficient C_{ij} in terms of the element coupling coefficient C_{ij}^e . (5)

Problem 6:

Use the Newton method (iterative) to solve the following nonlinear system of two equations:

$$2x^2y^2 - 5x^2y - 5 = 0$$

$$xy^2 + 3y - 4 = 0$$

Assume initial values $x = 1$ and $y = 1$. Determine x and y at the end of the first iteration.

a) What is the Jacobi matrix $J(x,y)$? Compute its initial determinant? (10)

b) Determine x_1 and y_1 at the end of the first iteration? (15)

Fall 2004:

Problem 4:

In free space an antenna radiates a field:

$$E_{\phi s} = E_0 \cos^2 \theta e^{-j\beta r} / (4\pi r)$$

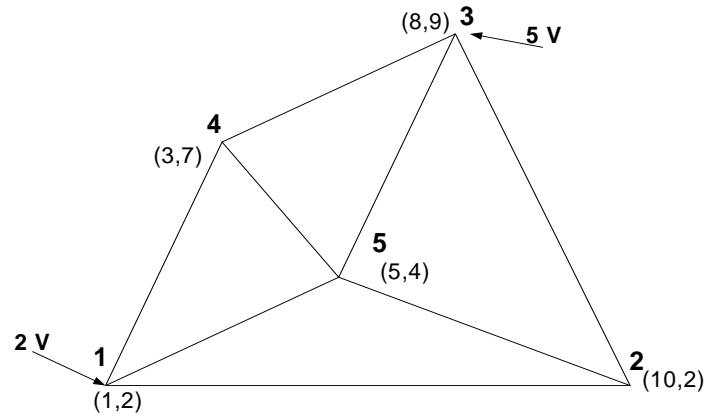
at far field. Determine the following:

(a) The time average Pointing vector P_{ave}

(b) The total radiated power P_{rad}

(c) The directive gain at $\theta = 60^\circ$

Problem 5:



Given the four element mesh shown above. The nodes and their coordinates are shown. Node 1 is held at 2V while node 3 is held at 5V:

(5) Dimension of the global coefficient matrix (size):

(6) what will be the general form of the global coefficient matrix (all elements)?

(3) What will be the final global coefficient matrix (non-zero elements only) State why elements are zeros?

Problem 6:

Use the Newton method to solve the following equations:

$$3x^3y - 5x^2y^3 - 4 = 0$$

$$xy^2 + 3y - 5 = 0$$

Assume initial values $x = 1$ and $y = 1$. Determine x and y at the end of the first iteration.

c) What is the Jacobi matrix $W(x,y)$

d) Determine x_1 and y_1 at the end of the first iteration?