FIGURE P4-16

Problems 4-52 to 4-54 An oil field pump - dimensions in inches

4-52   For the linkage in Figure P4-16, what are the angles that link 2 makes with the positive *X*-axis when links 2 and 3 are in toggle positions?

4-53   The coordinates of the point P_1 on link 4 in Figure P4-16 are (114.68, 33.19) with respect to the *xy* coordinate system when link 2 is in the position shown. When link 2 is in another position the coordinates of P_2 with respect to the *xy* system are (100.41, 43.78). Calculate the coordinates of P_1 and P_2 in the *XY* system for the two positions of link 2. What is the salient feature of the coordinates of P_1 and P_2 in the *XY* system?

4-54   Write a computer program or use an equation solver such as *Mathcad*, *Matlab*, or *TKSolver* to calculate and plot the angular position of link 4 with respect to the *XY* coordinate frame and the transmission angle at point *B* of the linkage in Figure P4-16 as a function of the angle of link 2 with respect to the *XY* frame.