Related reading and lectures: Sections 9.1 thu 9.3 of text, lectures 17 and 18.

Comments and Background:

        Homework problems are designed to reinforce key concepts introduced in class. If you work the problems thoroughly, grasp the underlying concepts, and develop some insights, you should do very well on the tests.

        Focusing on concepts and developing good engineering intuition is vital to us in our careers. In order to correctly analyze and design things, we must understand the underlying concepts and assumptions, choose or derive the correct equations, and develop a feeling for whether the calculations are correct.

        I encourage you to use this opportunity to develop a sound and efficient approach to problem solving and documentation. Where did the equation come from? What simplifying assumptions have you made? Always sketch out the circuit first. Make your diagrams "plenty big" so you can clearly label voltages, currents, polarities, sources, impedances, etc. Circle important answers or solutions. Use tables to organize data and results. Develop a clear style of writing and sketching - could someone take your work out of the project archives 20 years from now and follow what you did?

H6.1 - Wye and Delta configurations of sources, conversion back and forth:
        a) Draw a 208-volt three-phase positive sequence wye-connected source. The voltage V_{AN} is reference at 0°. What are the phasor values of all L-N voltages?
        b) Draw the a) "open" and b) "closed" voltage phasor diagrams showing all L-N voltages and the effective L-L voltages. Calculate the phasor values of the L-L voltages, and verify against the phasor diagram.
        c) Draw the corresponding delta-connected source. Label all L-L phasor voltages.

H6.2 - Wye and Delta configurations of loads, conversion back and forth:
        a) A balanced wye-connected load has an impedance of $Z = 2 + j5$ Ω in each phase. Convert it to its equivalent delta-connected load (i.e. calculate the per phase impedance for equivalent delta).
        b) A wye load has a neutral connection point while a delta does not have that possibility. The phase voltages of the wye are lower than the delta, but the phase currents of the wye are higher than the delta. From these perspectives, comment on pluses and minuses of specifying a design with wye vs. delta.

H6.3 - A 480-volt Y-connected source supplies a Δ-connected load composed of 3 identical impedances $Z = 16 - j9$ ohms. It is assumed that the angle of V_{AN} is reference at 0° and that the source is positive sequence.

        a) What is the magnitude of the phase voltage of the source? Of the load?
        b) What is the power factor of the load?
        c) Calculate the magnitude of the phase current in the delta load.
        d) Calculate the magnitude of the line current.
        e) Draw out the "closed" voltage phasor diagram, labeling all of the L-N and L-L voltages. Orient the phasors at their correct angle. Use arrowheads to indicate polarity.
        f) Calculate the phasor values of I_{AB}, I_{BC} and I_{CA} in the load. Calculate the phasor values of the line currents I_A, I_B and I_C flowing toward the load.