


5. **Power Calculation.** We saw in class that the real power transmitted from node 1 to node 2, one at $V_1 \angle \delta_1$ and the other at $V_2 \angle \delta_2$ with only an impedance $jX$ in between, can be calculated as

$$P = \frac{V_1 V_2}{X} \sin(\delta_1 - \delta_2).$$

For simplicity, take the reference axis at $\delta_2$ so you may assume $\delta_2 = 0$. Show that this equation is correct by calculating $S$. Note that in class we proved the same using the phasor diagram.

6. **Synchronous Machine Speed.** We have a 3φ 60 Hz power supply and two 3φ SMs. Determine the speed and a suitable number of poles (this is “a,” not “the”), for each SM to provide the following:

- A 3φ 180 Hz supply.
- A 3φ 500 Hz supply.