Topics for Today:

• Homework #6 - Due Wed.
• Convergence considerations, generating fractals, etc.
• Sensitivities in loadflow - changes in P, Q due to V, δ.
• Optimal Dispatch for simple lossless system
• Reading: §6.3.1; EE5200 Text - §13.1 thru §13.5
• Simple example for 2-generator system
• Incremental cost, \( \lambda \)

Coming up:

• Optimal dispatch including system losses
• Programming details
\[ f(x,y) = x^2 + y^2 \]
\[ g(x,y) = 2x - y + 8 = 0 \]

Active:
inactive constraint

Can handle in LP with "slack variables"

\[
\begin{align*}
g_1(x,y) &\leq 0 \\
g_2(x,y) &\leq 0
\end{align*}
\]

\[
\begin{align*}
g_1(x,y) + s_1^2 &= 0 \\
g_2(x,y) + s_2^2 &= 0
\end{align*}
\]

If above const. was changed to \( g(x,y) : 2x - y + 8 \leq 0 \) then \( g_1(x,y) = 2x - y + 8 + s^2 = 0 \)
Basics on $[Y]$ & $[Z]$

Note: $[Y_{bus}]$ is nodal admittance matrix.

\[
[Y_{bus}][V_{node}] = [I_{int}]
\]

\[
[Z_{bus}] = [Y_{bus}]^{-1}
\]

\[
[Z_{bus}] = \begin{bmatrix}
Z_{11} & Z_{12} & \cdots & Z_{1N} \\
Z_{21} & Z_{22} & \cdots & Z_{2N} \\
\vdots & \vdots & \ddots & \vdots \\
Z_{N1} & Z_{N2} & \cdots & Z_{NN}
\end{bmatrix}
\]

$Z_{kk}$ = Thev or "Driving Point" $Z$'s
$Z_{jk}$ = Transfer impedances.
Possible to find a given $Z_{jk}$

\[
[Y_{\text{Bus}}]^{-1} = [Z_{\text{Bus}}]
\]

\[
[Z_{\text{bus}}] [I] = [V]
\]

\[
\begin{bmatrix}
Z_{11} & \ldots & 0 \\
\vdots & \ddots & \vdots \\
0 & \ldots & Z_{nn}
\end{bmatrix}
\begin{bmatrix}
0 \\
\vdots \\
0
\end{bmatrix}
= \begin{bmatrix}
V_1 \\
\vdots \\
V_n
\end{bmatrix}
\Rightarrow Z_{22} = \frac{V_2}{I_2}
\]
If system is in \([Y\text{bus}]\) formation

\[
[Y_{bus}][V_2] = \begin{bmatrix}
0 & 0 \\
0 & 0 \\
0 & 1
\end{bmatrix}
\Rightarrow Z_{22} = \frac{V_2}{I_2}
\]