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HW #3

$$f(\underline{x}) = x_1^3 - 6x_1^2 + 11x_1 + x_3 \quad \underline{x} \in \mathbb{R}_{\geq 0}^3$$

$$\tilde{h}_j(\underline{x}, s_j) = g_j(\underline{x}) + s_j^2 \quad j = 1 \rightarrow 3$$

$$g_1(\bar{x}) = x_1^2 + x_2^2 - x_3^2 \leq 0 \quad g_2(\bar{x}) = \sqrt{x_1^2 + x_2^2 + x_3^2} \geq 2 \quad g_3(\bar{x}) = x_3 \leq 5$$

$$L(\bar{x}, \bar{p}, \bar{s}) = f(\bar{x}) + \bar{p}^T \begin{bmatrix} h(\bar{x}) \\ \tilde{h}(\bar{x}, \bar{s}) \end{bmatrix}$$

$$L(x, p, s) = (x_1^3 - 6x_1^2 + 11x_1 + x_3) + p_1 (x_1^2 + x_2^2 - x_3^2 + s_1^2) \\ + p_2 (2 - \sqrt{x_1^2 + x_2^2 + x_3^2} + s_2^2) \\ + p_3 (x_3 - 5 + s_3^2)$$

Using Matlab `fsolve()`,

$x_1 = 2$	$p_1 = 0.25$	$s_1 = 0$
$x_2 = 0$	$p_2 = 0$	$s_2 = 0.91$
$x_3 = 2$	$p_3 = 0$	$s_3 = 1.732$

\* Matlab outputs shown on the next page