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HW #3

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

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

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

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

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

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