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1. a)

$$f(x,y,z) = 2x^2 + y^2 + 4z^2 - 2yx - 2x - 6y + 8$$

$$f_x = 4x - 2 \qquad f_{xx} = 4$$
$$f_y = 2y - 2z - 6 \qquad f_{yy} = 2$$
$$f_z = 8z - 2y \qquad f_{zz} = 8$$

$$f_{xy} = 0 \qquad f_{yx} = 0$$
$$f_{xz} = 0 \qquad f_{zx} = 0$$
$$f_{yz} = -2 \qquad f_{zy} = -2$$

TODO

Hesse Matrix:

$$A = \begin{pmatrix} 4 & 0 & 0 \\ 0 & 2 & -2 \\ 0 & 0 & 8 \end{pmatrix}$$

2. a) (i) $\mathbf{x^2 + 2x - 35 = 0}$

$$x_{1|2} = -\frac{2}{2} \pm \sqrt{\left(\frac{2}{2}\right)^2 + 35}$$

$$= -1 \pm \sqrt{1 + 35}$$

$$x_1 = 5 \qquad x_2 = -7$$

(ii)

$$x^2 + 2x + 10 = 10$$

$$x_{1|2} = -\frac{2}{2} \pm \sqrt{\left(\frac{2}{2}\right)^2 - 10}$$

$$= -1 \pm \sqrt{1 - 10}$$

$$x_1 = -1 + 3i \qquad x_2 = -1 - 3i$$

(iii)

$$x^2 - 18x + 81 = 0$$

$$x_{1|2} = -\frac{18}{2} \pm \sqrt{\left(-\frac{18}{2}\right)^2 - 81}$$

$$= -9 \pm \sqrt{(-9)^2 - 81}$$

$$x_1 = 9$$

3.

4.