# MATH 173A - HW5

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## Problem 1

$$f(x) = (2x_1 - 1)^4 + (x_1 + x_2 - 1)^2$$

$$\nabla f(x) = \begin{bmatrix} 8(2x_1 - 1)^3 + 2(x_1 + x_2 - 1) \\ 2(x_1 + x_2 - 1) \end{bmatrix} \qquad \nabla^2 f(x) = \begin{bmatrix} (48(2x_1 - 1)^2 + 2) & 2 \\ 2 & 2 \end{bmatrix} \qquad x_0 = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$$x_{t+1} = x_t - \nabla^2 f(x_t)^{-1} \cdot \nabla f(x_t)$$

$$x_1 = x_0 - \nabla^2 f(x_0)^{-1} \cdot \nabla f(x_0) = \begin{bmatrix} -\frac{1}{6} \\ -\frac{5}{6} \end{bmatrix} \tag{1}$$

$$x_2 = x_1 - \nabla^2 f(x_1)^{-1} \cdot \nabla f(x_1) \approx \begin{bmatrix} 0.0078 \\ -0.4245 \end{bmatrix} \tag{2}$$

**Answer:** $x_2 = \begin{bmatrix} 0.0078 \\ -0.4245 \end{bmatrix}$