Assignment 12

1. Find an approximation for the minimum of the polynomial $x^4 + x^2 - 40x + 400$ by applying two steps of the golden-mean search starting with the interval [2, 2.5].

2. Find an approximation for the minimum of the polynomial $x^4 + x^2 - 40x + 400$ by applying two steps of the method of successive parabolic interpolation starting with $x_0 = 1.5$, $x_1 = 2.5$ and $x_2 = 2.0$.

3. Find an approximation for the minimum of the function $-\sin(x) + \sin(2x)$ by applying two steps of the golden-mean search starting with the interval [2, 2.5].

4. Find an approximation for the minimum of the function $-\sin(x) + \sin(2x)$ by applying two steps of the method of successive parabolic interpolation starting with $x_0 = 1.5$, $x_1 = 2.5$ and $x_2 = 2.0$.

5. Find an approximation of the minimum of the polynomial $x^2 + 2y^2 - xy - 8x + 5y - 1$ by applying the Hooke-Jeeves method starting with $x = y = 0$ and $h = 1$ and continuing until $h < 0.25$.

5. Find an approximation of the minimum of the polynomial $x^2 + 2y^2 - xy - 8x + 5y - 1$ by applying one step of Newton's method in n dimensions for finding extrema starting with $x = 4$ and $y = 0$.

6. Find the gradient of the polynomial $x^2 + 2y^2 - xy - 8x + 5y - 1$ at the point $x = 4$ and $y = 0$ and convert this into a polynomial in a single variable. The minimum of a quadratic polynomial $ax^2 + bx + c$ is $-b/2a$, so use this to determine the next point. Calculate the gradient at this second point.

7. Are the two gradient vectors in Question 6 reasonably orthogonal?