Ayush Gaggar — Homework 4 — 11/5/20

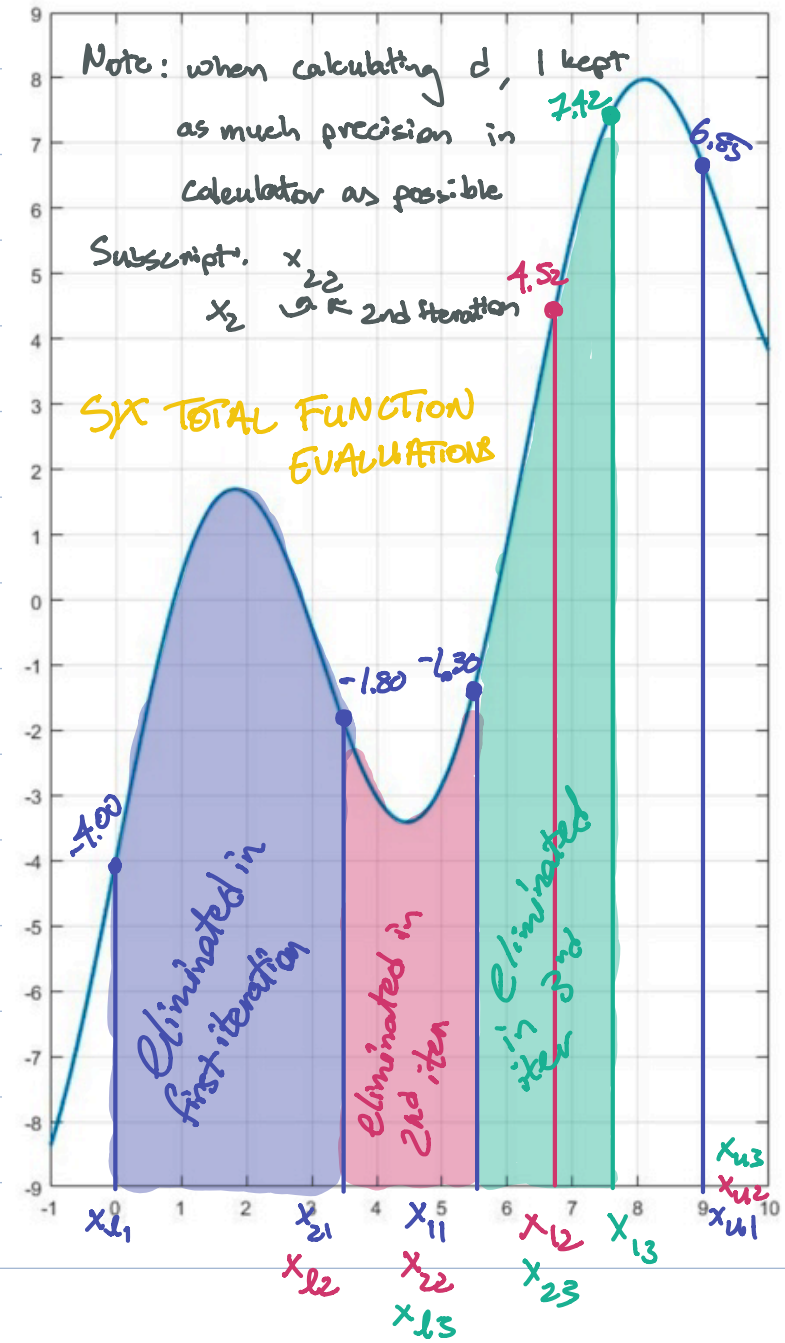
1.a) $-p_1\cos\theta_2 + p_3 = \cos(\theta_2 - \theta_4) - p_2\cos\theta_4$

$$\cos^{-1}\left(\frac{p_1\cos\theta_2 - p_3 + \cos(\theta_2 - \theta_4)}{p_2}\right) = \theta_4$$

2. a) $f(\theta_4) = 0 : \cos(\theta_2 - \theta_4) + p_1\cos\theta_2 - p_3 - p_2\cos\theta_4 = 0$

b) $$\frac{df}{d\theta_4} = \sin(\theta_2 - \theta_4) + p_2\sin\theta_4$$

3.



- First iteration: 4 function eval

$d_1 = R(x_u - x_l) = \frac{1}{2}(\sqrt{5} - 1)(9 - 0)$

$= 5.562306$

$x_{11} = 0 + d = 5.56$

$x_{21} = 9 - d = 3.44$; $f(x_{11}) > f(x_{21})$

- 2nd iteration: 1 new function eval

$x_{l2} = x_{21} = 3.44$; $x_{u2} = x_{u1}$

$d_2 = \frac{1}{2}(\sqrt{5} - 1)(9 - 3.44) = 3.43769$

$x_{12} = 3.44 + 3.44 = 6.875$

$x_{22} = 9 - 3.44 = 5.562$

$f(x_{12}) > f(x_{22})$

- 3rd iteration: $x_{l3} = x_{22}$, $x_{u3} = x_{u1}$

$d_3 = \frac{1}{2}(\sqrt{5} - 1)(9 - 5.562) = 2.125$

$x_{13} = 5.562 + 2.12 = 7.687$ ← 1 new function eval

$x_{23} = 9 - 2.12 = 6.875$

$f(x_{13}) > f(x_{23})$