Prelab 3

Tuesday, March 14, 2023 9:36 PM

1) a) $f(x) = x^4 - 6x^2 \Rightarrow f'(x) = 4x^3 - 12x \Rightarrow f''(x) = 12x^2 - 12$

when $f'(x) = 0 \Rightarrow x_1 = 0, x_2 = \sqrt{3}, x_3 = -\sqrt{3}$

$\Rightarrow f''(0) = -12 < 0$ local maximum.

$f''(\sqrt{3}) = 12 \cdot 3 - 12 = 24 > 0$ local minium.

$f''(-\sqrt{3}) = 12 \cdot 3 - 12 = 24 > 0$ local minium.

$\Rightarrow$ when $x = \mp\sqrt{3}$, $\Rightarrow$ local minium.

$\Rightarrow$ corresponding minimal : $f(\sqrt{3}) = 3^2 - 6 \times 3 = -9$

$f(-\sqrt{3}) = 3^2 - 6 \times 3 = -9$.

b) using gridient descent function in a loop function.

1. set up the x_0, and iteration couter $i = 0$
2. calculate the gridient let $g_i = f'(x_i)$
3. Set the next one, $x_{i+1} = x_i - g_i *$ learning rate.
4. using the loop function $i = i + 1$

c) set the maxium iteration, the gradient magnitude. set up a difference range.

b)

a) we can gaussian elimination on matrix $[A \mid 0]$ And use back-sub to find solution to $Ax = 0$ if there're non-zero solution in null space, $Ax = b$ can be writen as $x = x_0 +$ null space of $A *$ arbitrary vector within null space.

b) $c = (a \cdot b / \|a\|^2) * a$.