

$$\frac{u}{v} \quad \frac{u'v - v'u}{v^2}$$

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باعث

31 January 2018

١٤٢٩ جمادى الاولى

جهاز شبل

E 8.1]

$$f(x) = \frac{-3x^2 - \frac{3}{4}}{\left(x^3 + \frac{3}{4}x - \frac{1}{2}\right)^2}$$

$$f''(x) = \frac{-6x\left(x^3 - \frac{3}{4}x - \frac{1}{2}\right) - \left(-3x^2 - \frac{3}{4}\right)\left(-3x^2 - \frac{3}{4}\right)}{\left(x^3 + \frac{3}{4}x - \frac{1}{2}\right)^4}$$

$$f(x) = f(0.5) + f'(0.5) dx (x+0.5) + \frac{1}{2} f''(0.5) dx^2 (x+0.5)^2$$

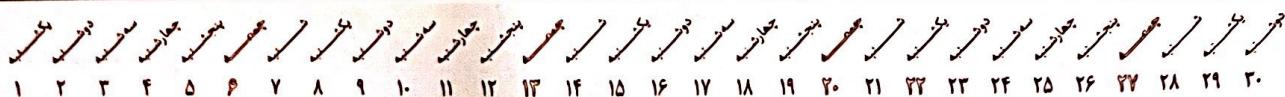
$$\Rightarrow f(x) = \frac{1}{-\frac{1}{8} - \frac{3}{4}(-\frac{1}{2}) - \frac{1}{2}} + \frac{\left(-3(\frac{1}{4}) - \frac{3}{4}\right)(x + \frac{1}{2})}{\left(-\frac{1}{8} + \frac{3}{4}(-\frac{1}{2}) - \frac{1}{2}\right)^2}$$

$$+ \frac{1}{2} \frac{-6(-\frac{1}{2})(\frac{1}{8} + \frac{3}{8} - \frac{1}{2}) - \left(-\frac{3}{4} - \frac{3}{4}\right)^2}{\left(-\frac{1}{8} + \frac{3}{4}(-\frac{1}{2}) - \frac{1}{2}\right)^4}$$

$$f(x) \rightarrow (i) \text{ میں کسی نہیں}$$

(iii) python is needed!

شهادت حضرت فاطمہ زہرا سلام ا... علیہا (۱۱۰ ق) بد روابط



$$(SOL)$$

$$a = 2x_1^2 + 2x_2^2 + x_1 - 5x_2 + 1$$

E 8.2

جاء

IC

3 February 2018

جمادى الاولى ١٤٢٩

شنبه

$$\nabla f(x) = \begin{bmatrix} (4x_1+1)e^{4x_1+1} \\ (4x_2-5)e^{4x_2-5} \end{bmatrix}$$

$$\nabla^2 f(x) = \begin{bmatrix} 4e^a + (4x_1+1)^2 e^a & (4x_2-5)(4x_1+1)e^a \\ (4x_2-5)(4x_1+1)e^a & 4e^a + (4x_2-5)^2 e^a \end{bmatrix}$$

جاء

$$f(x) = f(x^*) + \nabla f(x)^\top \Big|_{x=x^*} (x - x^*) + \frac{1}{2} (x - x^*)^\top \nabla^2 f(x) \Big|_{x=x^*} (x - x^*)$$

$$x = [0 \ 0]^\top$$

$$f(x) = e^{10} + \begin{bmatrix} e^{10} \\ -5e^{10} \end{bmatrix}^\top (x - [0 \ 0]) + \frac{1}{2} [x_1 \ x_2] \underbrace{\nabla^2 f(x^*)}_{\nabla^2 f(x^*) = \begin{bmatrix} 2e^{10} + e^{20} & -5e^{10} \\ -5e^{10} & 4e^{10} + 25e^{10} \end{bmatrix}} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

$$\nabla^2 f(x) \Big|_{x=x^*} = \begin{bmatrix} 2e^{10} + e^{20} & -5e^{10} \\ -5e^{10} & 4e^{10} + 25e^{10} \end{bmatrix}$$

$$\Rightarrow f(x) = e^{10} + x_1 e^{10} - 5x_2 e^{10} + \frac{1}{2} [x_1 \ x_2] \begin{bmatrix} 5e^{10} & -5e^{10} \\ -5e^{10} & 25e^{10} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

$$\frac{1}{2} (5x_1^2 e^{10} - 5x_1 x_2 e^{10} - 5x_1 x_2 e^{10} + 25x_2^2 e^{10}) \begin{bmatrix} 5x_1 e^{10} - 5x_2 e^{10} \\ 5x_1 e^{10} + 25x_2 e^{10} \end{bmatrix}$$

روز فناوری فضایی

١	٢	٣	٤	٥	٦	٧	٨	٩	١٠	١١	١٢	١٣	١٤	١٥	١٦	١٧	١٨	١٩	٢٠	٢١	٢٢	٢٣	٢٤	٢٥	٢٦	٢٧	٢٨	٢٩	٣٠
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$$f(x) = e^x + x_1 e^x - 5x_2 e^x + \frac{5}{2} x_1^2 e^x - 5x_1 x_2 e^x + \frac{29}{2} x_2^2 e^x$$

(ii) $\left\{ \begin{array}{l} \text{جذب مُستقر} \text{ أو} \text{ هُرْبَارِم} \\ f(x)/dx = 0 \end{array} \right.$

(iii) $e^a / d(x_1, x_2) = 0 \Rightarrow \nabla f(x) = 0$

$$\begin{bmatrix} (4x_1 + 1) e^a \\ (4x_2 - 5) e^a \end{bmatrix} = 0 \Rightarrow \left[-\frac{1}{4}, \frac{5}{4} \right]$$

(iv) python

٣	٤	٥	٦	٧	٨	٩	١٠	١١	١٢	١٣	١٤	١٥	١٦	١٧	١٨	١٩	٢٠	٢١	٢٢	٢٣	٢٤	٢٥	٢٦	٢٧	٢٨	٢٩	٣٠
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F8.3

$$(i) L(x) = \frac{1}{2}x_1^2 - 6x_1x_2 - x_2^2$$

$$\nabla f(x) = \begin{bmatrix} 7x_1 - 6x_2 \\ -2x_2 - 6x_1 \end{bmatrix} \xrightarrow{x^* = \begin{bmatrix} 1 \\ 1 \end{bmatrix}} \begin{bmatrix} 1 \\ -8 \end{bmatrix}$$

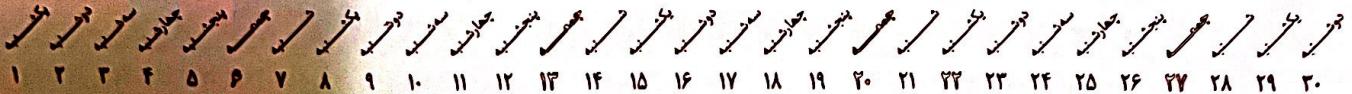
first order $\frac{p^T \nabla f(x)}{\|p\|} = \frac{[-1 \ 1] \begin{bmatrix} 1 \\ -8 \end{bmatrix}}{\sqrt{2}} = \frac{-1 - 8}{\sqrt{2}} = -\frac{9}{\sqrt{2}}$

$$\nabla^2 f(x) = \begin{bmatrix} 7 & -6 \\ -6 & -2 \end{bmatrix}$$

second order $\frac{p^T \nabla^2 f(x) p}{\|p\|}$

second order $\frac{[-1 \ 1] \begin{bmatrix} 7 & -6 \\ -6 & -2 \end{bmatrix} \begin{bmatrix} -1 \\ 1 \end{bmatrix}}{\sqrt{2}} = \frac{[-1 \ 1] \begin{bmatrix} -13 \\ 4 \end{bmatrix}}{\sqrt{2}} = \frac{13 + 4}{\sqrt{2}} = \frac{17}{\sqrt{2}}$

بعضی کے مقابلے میں کوئی



E 8.4]

$$f(x) = x^4 - \frac{1}{2}x^2 + 1$$

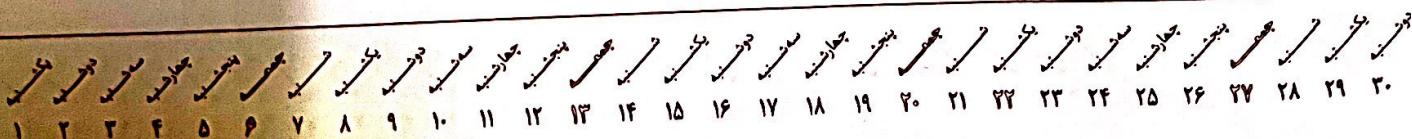
 $f'(x) dx$:

$$(i) 4x^3 - x = 0 \Rightarrow x(4x^2 - 1) = 0 \Rightarrow \begin{cases} x=0 \\ x=\pm\frac{1}{2} \end{cases}$$

Stationary points مُنقطة محطة

$$(ii) f''(x) = 12x^2 - 1 = 0 \xrightarrow{x=0} -1 \rightarrow \text{maximum}$$

$$\begin{cases} x=\frac{1}{2} \\ x=-\frac{1}{2} \end{cases} \xrightarrow{x=\frac{1}{2}} 2 \rightarrow \text{local minimum} \\ \xrightarrow{x=-\frac{1}{2}} 2 \rightarrow \text{minimum}$$

. (عکس $f(x)$) يوضح $f(x)$ global = local وفقاً لـ $f(0)=1 \rightarrow \text{global maximum}$ $f(\frac{1}{2}) = \frac{1}{16} - \frac{1}{8} + 1 \rightarrow$ $\text{نقطة محطة عالمية فتحت}$ $f(-\frac{1}{2}) = \frac{1}{16} - \frac{1}{8} + 1 \rightarrow$ $\text{نقطة محطة عالمية مغلقة فتحت}$ 

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بعض

پنجشنبه

8 February 2018
جمادی الاولی ١٤٢٩

E8.5 ادامی اول

$$\nabla^2 f(x) \Big|_{x=x_1} \sim \nabla^2 f(x) = \begin{pmatrix} 20.43 & 8.43 \\ 8.43 & 20.43 \end{pmatrix}$$

eigen values $(20.43 - \lambda)^2 - (8.43)^2 = 0$

$$20.43 - \lambda - 8.43 = 0 \Rightarrow \lambda_1 = 12$$

$$20.43 - \lambda + 8.43 = 0 \Rightarrow \lambda_2 = 28.86$$

~~سیکلیک minimum~~ حکم مینیمم نظری

دوز پیروی هوابی

١٩٠٧

بعض

1907 9 February 2018
جمادی الاولی ١٤٢٩

$$\nabla^2 f(x) \Big|_{x=x_2^2} \Rightarrow \nabla^2 f(x) = \begin{bmatrix} 0.3468 & -11.65 \\ -11.65 & 0.3468 \end{bmatrix}$$

$$(0.3468 - \lambda)^2 - (-11.65)^2 = 0$$

$$0.3468 - \lambda - 11.65 = 0 \Rightarrow \lambda_1 = -11.3064$$

$$0.3468 - \lambda + 11.65 = 0 \Rightarrow \lambda_2 = 12$$

نقطه saddle point نظری x^2 ~~سیکلیک~~

۱	۲	۳	۴	۵	۶	۷	۸	۹	۱۰	۱۱	۱۲	۱۳	۱۴	۱۵	۱۶	۱۷	۱۸	۱۹	۲۰	۲۱	۲۲	۲۳	۲۴	۲۵	۲۶	۲۷	۲۸	۲۹
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$$\left. \frac{\partial^2 L(x)}{\partial x^3} \right|_{x=2} \Rightarrow \begin{bmatrix} 15.3499 & 3.3499 \\ 3.3499 & 15.3499 \end{bmatrix}$$

$$(15.3499 - \lambda)^2 - (3.3499)^2 = 0$$

$$(6.3499 - \lambda - 3.3499) = 0 \Rightarrow \lambda = 12$$

$$15.3499 - 1 + 3.3499 \rightarrow \Rightarrow d_2 = 18.69$$

Global mind

(iii) Taylor series

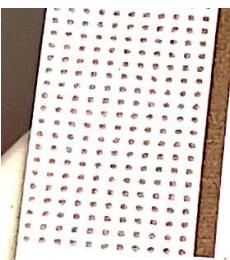
$$L(x) = f(x^*) + \nabla F(x)^\top (x - x^*) + \frac{1}{2} (x - x^*)^\top \nabla^2 F(x) (x - x^*)$$

$$f(x) = 6.026 + \begin{bmatrix} 0 \\ 0 \end{bmatrix}(x - x^*) + \frac{1}{2} \begin{bmatrix} (x - x^*)^\top & \end{bmatrix} \begin{bmatrix} 20.43 & 8.43 \\ 8.43 & 20.43 \end{bmatrix} (x - x^*)$$

$$f(x) = 6.076 + \frac{1}{2} [x_1 + 0.6504 x_2 + 0.6504] \begin{bmatrix} 20.43 & 8.43 \\ 8.43 & 20.43 \end{bmatrix} \begin{bmatrix} x_1 + 0.6504 \\ x_2 + 0.6504 \end{bmatrix}$$

$$f(x) = 1.0841 + \frac{1}{2} \begin{bmatrix} x_1 - 0.083 & x_2 - 0.085 \end{bmatrix} \begin{bmatrix} 0.3468 & -11.65 \\ -11.65 & 0.3468 \end{bmatrix} \begin{bmatrix} x_1 - 0.083 \\ x_2 - 0.085 \end{bmatrix}$$





مپ

بکشنه

11 February 2018
١٤٢٩ جمادی الاولی

بهماء

٦٨.٥ متر

٣ خطی

$$f(x) = -0.0702 + \frac{1}{2} [x_1 - 0.9655 \quad x_2 - 0.9655] \begin{pmatrix} 15.3499 & 3.3499 \\ 3.3499 & 15.3499 \end{pmatrix}$$

$$\begin{pmatrix} x_1 - 0.9655 \\ x_2 - 0.9655 \end{pmatrix}$$