

<u>Help</u>

sandipan\_dey >

<u>Course</u> <u>Progress</u> <u>Dates</u> <u>Calendar</u> <u>Discussion</u> <u>Notes</u>



()

### 4. Linearization

□ Bookmark this page

9/3/2021

Problem Set A due Sep 15, 2021 20:30 IST



**Practice** 

#### Linearize

1/1 point (graded)

Suppose A and B are obtained from x,y by

$$A = xy^2 + x^2 - 6xy - y^2 + 7x + 7y - 11 (5.191)$$

$$B = xy - 4x - y + 4 (5.192)$$

Compute the linearization of the relationship  $x,y \implies A,B$  at the point (1,3).

(Enter a matrix using notation such as [[a,b],[c,d]].)

#### **Solution:**

We compute the partial derivatives:

$$egin{align} rac{\partial A}{\partial x} &= y^2 + 2x - 6y + 7 & rac{\partial A}{\partial y} &= 2xy - 7x - 2y + 7 \ rac{\partial B}{\partial x} &= y - 4 & rac{\partial B}{\partial y} &= x - 1 \ \end{pmatrix}$$

Evaluating each at the point (x,y)=(1,3) we obtain

$$egin{aligned} rac{\partial A}{\partial x} &= 0 & rac{\partial A}{\partial y} &= 1 \ rac{\partial B}{\partial x} &= -1 & rac{\partial B}{\partial y} &= 0 \end{aligned}$$

Therefore, the linearization is given by the matrix of partial derivatives:

$$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} \tag{5.193}$$

Submit

You have used 1 of 3 attempts

**1** Answers are displayed within the problem

### Recognize

1/1 point (graded)

Which of the following describes the matrix you found in the previous problem?

The identity matrix

 $\bigcirc$  Rotation by  $\pi/2$  counter-clockwise

Reflecti	ion across the line $oldsymbol{y}=oldsymbol{x}$		
Reflecti	ion across the line $\pmb{y}=-\pmb{x}$		
<b>~</b>			
olution:			
ne matrix (	$egin{pmatrix} 0 & 1 \ -1 & 0 \end{pmatrix}$ represents rotation by $\pi/2$ clockwise, that is, $\pi/2$	$R_{-\pi/2}$ . One can quickly verify this by	
(	-1  0	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
ecking that	t the vector $egin{pmatrix} 1 \ 0 \end{pmatrix}$ is sent to $egin{pmatrix} 0 \ -1 \end{pmatrix}$ , and the vector $egin{pmatrix} 0 \ 1 \end{bmatrix}$	) is sent to $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$ .	
Cuda ras in			
Submit	You have used 1 of 2 attempts		
	You have used 1 of 2 attempts s are displayed within the problem		
Answers	s are displayed within the problem	Hide Discussion	
• Answers • Lineariz	s are displayed within the problem	Hide Discussion	n
• Answers • Lineariz	are displayed within the problem	Hide Discussion Add a P	
Answers Lineariz	are displayed within the problem		ost
Answers Lineariz pic: Unit 4: Mate	are displayed within the problem  Zation  trices and Linearization / 4. Linearization	Add a P	ost
Answers Lineariz  Dic: Unit 4: Mate	are displayed within the problem  Zation  trices and Linearization / 4. Linearization	Add a P	ost
Answers Lineariz pic: Unit 4: Mate	are displayed within the problem  Zation  trices and Linearization / 4. Linearization	Add a P	ost
Answers Lineariz  Dic: Unit 4: Mate	are displayed within the problem  Zation  trices and Linearization / 4. Linearization	Add a P	Post
Answers  Lineariz  Dic: Unit 4: Mate	are displayed within the problem  Zation  trices and Linearization / 4. Linearization	Add a P	Post
Answers  Lineariz  Dic: Unit 4: Mate	are displayed within the problem  Zation  trices and Linearization / 4. Linearization	Add a P	Post
Answers  Lineariz  Dic: Unit 4: Mate	are displayed within the problem  Zation  trices and Linearization / 4. Linearization	Add a P	Post
Answers  Lineariz  Dic: Unit 4: Mate	are displayed within the problem  Zation  trices and Linearization / 4. Linearization	Add a P	Post

© All Rights Reserved



# edX

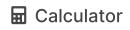
<u>About</u>

<u>Affiliates</u>

edX for Business

Open edX

<u>Careers</u>



# Legal

Terms of Service & Honor Code

<u>Privacy Policy</u>

**Accessibility Policy** 

**Trademark Policy** 

<u>Sitemap</u>

## **Connect**

<u>Blog</u>

**Contact Us** 

Help Center

Media Kit

**Donate** 















© 2021 edX Inc. All rights reserved.

深圳市恒宇博科技有限公司 <u>粤ICP备17044299号-2</u>