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★ Course/ Unit 1: Functions of two vari... / Lecture 2: Linear approximations and tangent ...



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Lecture due Aug 4, 2021 20:30 IST Completed



Practice

Second example, the computations

5/5 points (graded)

Find the linear approximation of $g\left(x,y
ight)=xy-x^2$ near $\left(x_0,y_0
ight)=\left(2,1
ight)$.

Compute the partial derivatives:

$$g_x\left(x,y
ight)=$$
 $y-2* imes x$

Answer: $y-2* imes x$
 x
 x

Evaluate the partial derivatives at the point (2, 1):

$$g_x\left(2,1
ight)=$$
 $g_y\left(2,1
ight)=$ 2 Answer: 2

Evaluate the function at (2,1):

? INPUT HELP

Solution:

Carry out each computation directly.

$$g\left(2,1\right) =\left(2\right) \left(1\right) -\left(2\right) ^{2}=-2$$

To compute $oldsymbol{g_x}$, differentiate with respect to $oldsymbol{x}$ treating $oldsymbol{y}$ as a constant:

$$g_{x}\left(x,y
ight) =y-2x,\qquad g_{x}\left(2,1
ight) =1-2\left(2
ight) =-3.$$

To compute $oldsymbol{g_y}$, differentiate with respect to $oldsymbol{y}$ treating $oldsymbol{x}$ as a constant:

$$g_{y}\left(x,y
ight) =x,\qquad g_{y}\left(2,1
ight) =2.$$

Submit

You have used 1 of 5 attempts

1 Answers are displayed within the problem

Example completed

10/7/21, 1:37 AM

Enter the linear approximation of $g\left(x,y
ight)=xy-x^2$ near $(x_0,y_0)=(2,1)$ in terms of Δx and Δy .

(Type Deltax for Δx and Deltay for Δy .)

$$g\left(2+\Delta x,1+\Delta y
ight)pprox$$
 -2-3*Deltax+2*Deltay $ightharpoonup$ Answer: -2-3*Deltax+2*Deltay

? INPUT HELP

Solution:

Plug in the values for $g\left(2,1
ight)$, $g_{x}\left(2,1
ight)$, and $g_{y}\left(2,1
ight)$ found above to get

$$g\left(2+\Delta x,1+\Delta y
ight)pprox\underbrace{-2}_{g\left(2,1
ight)}\underbrace{-3}_{g_{x}\left(2,1
ight)}\Delta x+\underbrace{2}_{g_{y}\left(2,1
ight)}\Delta y.$$

Submit

You have used 1 of 5 attempts

Answers are displayed within the problem

Third example problem

1.0/1 point (graded)

Find the linear approximation of $h\left(x,y
ight)=x^2-y^2$ near $(x_0,y_0)=(1,0)$ in terms of Δx and Δy .

(Type Deltax for Δx and Deltay for Δy .)

$$h\left(1+\Delta x,\Delta y
ight)pprox egin{array}{c} ext{1+2*Deltax} \end{array}$$
 $ightharpoonup$ Answer: 1+2*Deltax

? INPUT HELP

Solution:

Carry out each computation directly.

$$h(1,0) = (1)^2 - (0)^2 = 1$$

To compute $oldsymbol{f_x}$, differentiate with respect to $oldsymbol{x}$ treating $oldsymbol{y}$ as a constant:

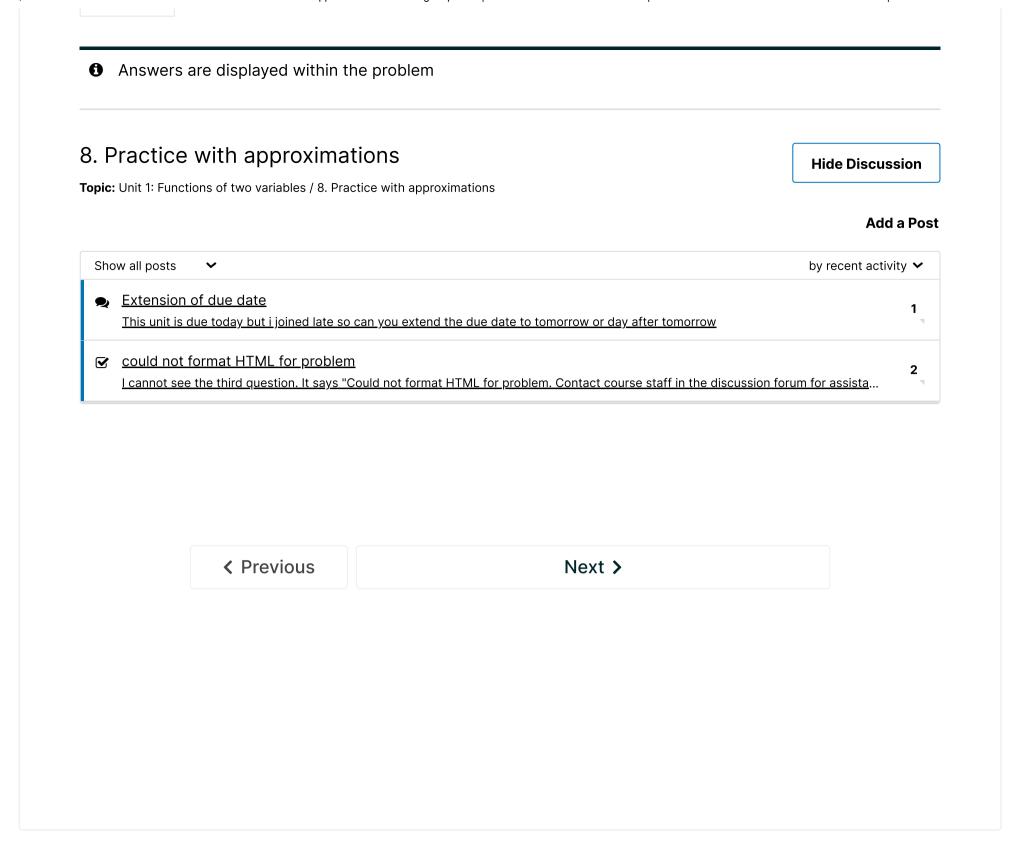
$$h_x(x,y) = 2x, \qquad h_x(1,0) = (2)(1) = 2.$$

To compute $oldsymbol{h_y}$, differentiate with respect to $oldsymbol{y}$ treating $oldsymbol{x}$ as a constant:

$$h_{y}\left(x,y
ight) =-2y,\qquad h_{y}\left(1,0
ight) =0.$$

Plug in the values for $g\left(1,0
ight)$, $g_{x}\left(1,0
ight)$, and $g_{y}\left(1,0
ight)$ found above to get

$$h\left(1+\Delta x,\Delta y
ight)pprox 1+2\Delta x$$



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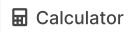
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