MITx 18.02.1x
Multivariable Calculus 1: Vectors and Derivatives

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8. Practice with approximations

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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 $g(x, y) = xy - x^2$ near $(x_0, y_0) = (2, 1)$.

Compute the partial derivatives:

$g_x(x, y) =$

| y-2*x |
✔ **Answer:** y-2*x

$y - 2 \cdot x$

$g_y(x, y) =$

| x |
✔ **Answer:** x

x

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

$g_x(2, 1) =$

| -3 |
✔ **Answer:** -3

$g_y(2, 1) =$

| 2 |
✔ **Answer:** 2

Evaluate the function at $(2, 1)$:

$g(2, 1) =$ | -2 |
✔ **Answer:** -2

?   INPUT HELP

Solution:

Carry out each computation directly.

$$g(2, 1) = (2)(1) - (2)^2 = -2$$

To compute g_x, differentiate with respect to x treating y as a constant:

$$g_x(x, y) = y - 2x, \qquad g_x(2, 1) = 1 - 2(2) = -3.$$

To compute g_y, differentiate with respect to y treating x as a constant:

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

Submit   You have used 1 of 5 attempts

ℹ   Answers are displayed within the problem

Example completed

1.0/1 point (graded)

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

(Type `Deltax` for Δx and `Deltay` for Δy.)

$g(2 + \Delta x, 1 + \Delta y) \approx$

| -2-3*Deltax+2*Deltay |

✔ **Answer:** -2-3*Deltax+2*Deltay

? INPUT HELP

Solution:

Plug in the values for $g(2, 1)$, $g_x(2, 1)$, and $g_y(2, 1)$ found above to get

$$g(2 + \Delta x, 1 + \Delta y) \approx \underbrace{-2}_{g(2,1)} \underbrace{-3}_{g_x(2,1)} \Delta x + \underbrace{2}_{g_y(2,1)} \Delta y.$$

Submit   You have used 1 of 5 attempts

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Third example problem

1.0/1 point (graded)
Find the linear approximation of $h(x, y) = x^2 - y^2$ near $(x_0, y_0) = (1, 0)$ in terms of Δx and Δy.

(Type `Deltax` for Δx and `Deltay` for Δy.)

$h(1 + \Delta x, \Delta y) \approx$

| 1+2*Deltax |

✔ **Answer:** 1+2*Deltax

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Solution:

Carry out each computation directly.

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

To compute f_x, differentiate with respect to x treating y as a constant:

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

To compute h_y, differentiate with respect to y treating x as a constant:

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

Plug in the values for $g(1, 0)$, $g_x(1, 0)$, and $g_y(1, 0)$ found above to get

$$h(1 + \Delta x, \Delta y) \approx 1 + 2\Delta x$$

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Submit   You have used 1 of 5 attempts

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8. Practice with approximations

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💬 **Extension of due date**
This unit is due today but i joined late so can you extend the due date to tomorrow or day after tomorrow
                                                                                                                1

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