You are taking "Exam (Timed, No Correctness Feedback)" as a timed exam. Show more

End My Exam 44:28:07

Previous Next

6. Linear approximation

Bookmark this page

Problem Set A due Aug 4, 2021 20:30 IST Completed

1A-9

5/5 points (graded)

Let $f(x,y) = \sin(xy^2 + y) + 2e^x$.

Compute the linear approximation of f around $(0,0)$. Express your answer in terms of x and y.

$f(x,y) \approx$ 2+2*x+y ✔ **Answer:** 2+2*x+y

$2 + 2 \cdot x + y$

Use your approximation from above to approximate $f(0.1, 0.2)$.

$f(0.1, 0.2) \approx$ 2.4 ✔ **Answer:** 2.4

We want to find a value of y near to zero so that $f(0,y) = 1.99$. Approximate this value of y.

$y \approx$ -0.01 ✔ **Answer:** -0.01

We want to find a point (x,y) near $(0,0)$ where $f(x,y) = 2$ and $x - y = 0.01$. Approximate this point (x,y). (Enter your answer to 5 decimal places.)

$x \approx$ 0.003333333 ✔ **Answer:** 0.01/3 $y \approx$ -0.006666667 ✔

Answer: -0.02/3

Solution:

To compute the linear approximation, we need the values

$$f(0,0) = \sin(0) + 2e^0 = 2$$

$$f_x(0,0) = y^2 \cos(xy^2 + y) + 2e^x\big|_{(x,y)=(0,0)} = 2$$

$$f_y(0,0) = \cos(xy^2 + y)(2xy + 1)\big|_{(x,y)=(0,0)} = 1.$$

Then we obtain

$$f(x,y) \approx f(0,0) + f_x(0,0)\,x + f_y(0,0)\,y = 2 + 2x + y$$

for (x,y) near $(0,0)$.

To approximate $f(0.1, 0.2)$, we substitute these values into our linear approximation to obtain

$$f(0.1, 0.2) \approx 2 + 2(0.1) + 0.2 = 2.4.$$

To find an approximate value of y near zero so that $f(0,y) = 1.99$, we use our linea d

Calculator Hide Notes

$$1.99 \approx 2 + 2\,(0) + 1\,(y)\,.$$

Solving for y yields $y \approx -0.01$. Therefore, $f\,(0, -0.01) \approx 1.99$.

Finally, to find the point (x, y) such that $f\,(x, y) = 2$ and $x - y = 0.01$, we can substitute $x = 0.01 + y$ into the linear approximation:

$$2 = 2 + 2\,(0.01 + y) + 1\,(y)\,.$$

Solving for y yields $y = -0.02/3$. Then from $x - y = 0.01$ we have $x = 0.01 - 0.02/3 = 0.01/3$.

Submit You have used 1 of 5 attempts

Answers are displayed within the problem

6. Linear approximation

Topic: Unit 1: Functions of two variables / 6. Linear approximation

Hide Discussion

Add a Post

Show all posts by recent activity

? First two answers 3
Dear teachers, Would you please let me know why my first answer is not correct? Also, I have calculated f(0.1,0.2) and L(0.1,0.2), and...

Trick to Save You Time! 3

Previous

Next Up: Problem Set 1B
2 min + 6 activities

Calculator Hide Notes

News

Legal

Terms of Service & Honor Code
Privacy Policy
Accessibility Policy
Trademark Policy
Sitemap

Connect

Blog
Contact Us
Help Center
Media Kit
Donate

Calculator Hide Notes