

⊞ Calculator

Recitation due Aug 18, 2021 20:30 IST Completed



Practice

4.

3.0/3 points (graded)

Calculate the gradient of the function x^3+2y^3 at the point (1,1).

(Enter vector surrounded by square brackets; e.g. type [1,-1] for the vector $\hat{i}-\hat{j}$.)

✓ Answer: [3,6]

Calculate the unit vector $\hat{m{u}}$ pointing in the direction of $\hat{m{i}}-\hat{m{j}}$.

(Enter vector surrounded by square brackets; e.g. type <code>[1,-1]</code> for the vector $\hat{\pmb{i}}-\hat{\pmb{j}}$.)

✓ Answer: (1/sqrt(2))*[1,-1]

Find the directional derivative $D_{\hat{u}}f$ at the point (1,1).

✓ Answer: -3/sqrt(2)

? INPUT HELP

Solution:

The gradient is $\nabla f = \langle 3x^2, 6y^2 \rangle$. At the point (1,1) this is the vector $\langle 3,6 \rangle$.

The vector $\vec{\boldsymbol{v}}$ has direction

$$rac{\langle 1,-1
angle}{|\langle 1,-1
angle|}=rac{1}{\sqrt{2}}\langle 1,-1
angle.$$

Thus the directional derivative is

$$abla f(1,1) \cdot rac{1}{\sqrt{2}} \langle 1,-1
angle = \langle 3,6
angle \cdot rac{1}{\sqrt{2}} \langle 1,-1
angle = rac{-3}{\sqrt{2}}.$$

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You have used 1 of 15 attempts

1 Answers are displayed within the problem

5.

3/3 points (graded)

In each of the following, a function $m{f}$, a point $m{P}$, and a vector $m{ec{v}}$ are given.

2/5

Function $f\left(x,y
ight)$ Point P Vector $ec{v}$ Answers

a)
$$z=rac{x}{y}$$
 (2,-1) $\hat{i}+2\hat{j}$ -sqrt(5) \checkmark Answer: -sqrt(5)

b)
$$z=x\sin y+y\cos x;$$
 $(0,\pi/2)$ $-3\hat{i}+4\hat{j}$ 1/5

c)
$$f(t,u) = \ln{(2t+3u)}$$
 (-1,1) $4\hat{i}-3\hat{j}$ -1/5

Solution:

a) The gradient is $abla f=\langle 1/y,-x/y^2
angle$. At the point (2,-1) this is the vector $\langle -1,-2
angle$.

The vector $ec{oldsymbol{v}}$ has direction

$$rac{\langle 1,2
angle}{|\langle 1,2
angle|}=rac{1}{\sqrt{5}}\langle 1,2
angle.$$

Thus the directional derivative is

$$abla f(1,1) \cdot rac{1}{\sqrt{5}} \langle 1,2
angle = \langle -1,-2
angle \cdot rac{1}{\sqrt{5}} \langle 1,2
angle = rac{-5}{\sqrt{5}} = -\sqrt{5}.$$

b) The gradient is $abla f = \langle \sin y - y \sin x, x \cos y + \cos x \rangle$. At the point $(0, \pi/2)$ this is the vector $\langle 1, 1 \rangle$.

The vector $ec{oldsymbol{v}}$ has direction

$$rac{\langle -3,4
angle}{|\langle -3,4
angle|}=rac{1}{5}\langle -3,4
angle.$$

Thus the directional derivative is

$$abla f\left(0,\pi/2
ight) \cdot rac{1}{5} \langle -3,4
angle = \langle 1,1
angle \cdot rac{1}{5} \langle -3,4
angle = rac{1}{5}$$

c) The gradient is $abla f=\langle rac{2}{2t+3u},rac{3}{2t+3u}
angle$. At the point (-1,1) this is the vector $\langle 2,3
angle$.

The vector $ec{m{v}}$ has direction

$$rac{\langle 4, -3
angle}{|\langle 4, -3
angle|} = rac{1}{5} \langle 4, -3
angle.$$

Thus the directional derivative is

$$abla f\left(-1,1
ight) \cdot rac{1}{5} \langle 4,-3
angle = \langle 2,3
angle \cdot rac{1}{5} \langle 4,-3
angle = rac{-1}{5}$$

Submit

You have used 1 of 15 attempts

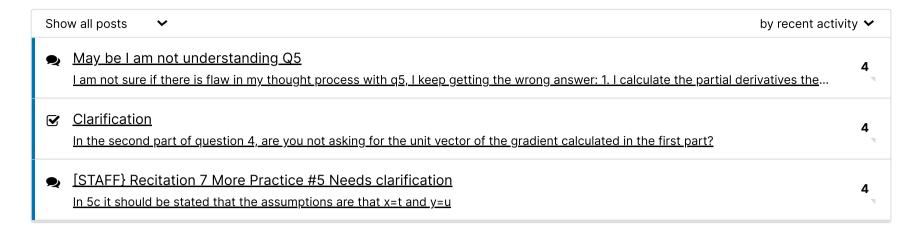
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2. More practice

Topic: Unit 2: Geometry of Derivatives / 2. More practice

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