CENGAGE | WEBASSIGN

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14.6 Derivada Direccional y 14.7-14.8 Optimizacion (Homework)

INSTRUCTOR
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Current Score

QUESTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
POINTS	1.5/1.5	1/1	1/1	1/1	2/2	3/3	1/1	2/0	2/1	2/2	2/2	2.1/0	2/3	1/0	3/3	3/3	2/2

TOTAL SCORE

42.1/33	127.6%

Due Date Past Due

SAT, APR 4, 2020
11:59 PM CST

Request Extension

Assignment Submission & Scoring

Assignment Submission

For this assignment, you submit answers by question parts. The number of submissions remaining for each question part only changes if you submit or change the answer.

Assignment Scoring

Your last submission is used for your score.

The due date for this assignment has passed.

Your work can be viewed below, but no changes can be made.

Important! Before you view the answer key, decide whether or not you plan to request an extension. Your Instructor may not grant you an extension if you have viewed the answer key. Automatic extensions are not granted if you have viewed the answer key.

Request Extension

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1. 1.5/1.5 POINTS | PREVIOUS ANSWERS | **SCALCET8 14.6.007.** | MY NOTES | ASK YOUR TEACHER

Consider the following.

$f(x, y) = x/y, \quad P(9, 1), \quad \mathbf{u} = \frac{3}{5}\mathbf{i} + \frac{4}{5}\mathbf{j}$

(a) Find the gradient of f.

$\nabla f(x, y) =$

$$(1y)i+(-xy2)j

(b) Evaluate the gradient at the point P.

$\nabla f(9, 1) =$

$$i-9j

(c) Find the rate of change of f at P in the direction of the vector $\mathbf{u}$.

$D_{\mathbf{u}} f(9, 1) =$

$$-335

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2. 1/1 POINTS | PREVIOUS ANSWERS | SCALCET8 14.6.011. | MY NOTES | ASK YOUR TEACHER

Find the directional derivative of the function at the given point in the direction of the vector **v**.

$f(x, y) = 3e^x \sin(y), \quad (0, \pi/3), \quad \mathbf{v} = \langle -6, 8 \rangle$

$D_{\mathbf{v}} f(0, \pi/3) =$

$$12-9\sqrt{310}$$

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3. 1/1 POINTS | PREVIOUS ANSWERS | SCALCET8 14.6.004. | MY NOTES | ASK YOUR TEACHER

Find the directional derivative of f at the given point in the direction indicated by the angle θ.

$f(x, y) = xy^3 - x^2, \quad (1, 4), \quad \theta = \pi/3$

$D_{\mathbf{u}} f(1, 4) =$

$$31+24\sqrt{3}$$

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4. 1/1 POINTS | PREVIOUS ANSWERS | SCALCET8 14.6.015. | MY NOTES | ASK YOUR TEACHER

Find the directional derivative of the function at the given point in the direction of the vector **v**.

$f(x, y, z) = x^2y + y^2z, \quad (2, 7, 9), \quad \mathbf{v} = \langle 2, -1, 2 \rangle$

$D_{\mathbf{v}} f(2, 7, 9) =$

$$8

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5. 2/2 POINTS | PREVIOUS ANSWERS | SCALCET8 14.6.023.MI. | MY NOTES | ASK YOUR TEACHER

Find the maximum rate of change of f at the given point and the direction in which it occurs.

$f(x, y) = 8 \sin(xy), \quad (0, 2)$

$$16

maximum rate of change

✔

$$i

direction vector

✔

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6. 3/3 POINTS | PREVIOUS ANSWERS | SCALCET8 14.6.023.MI.SA. | MY NOTES | ASK YOUR TEACHER

This question has several parts that must be completed sequentially. If you skip a part of the question, you will not receive any points for the skipped part, and you will not be able to come back to the skipped part.

Tutorial Exercise

Find the maximum rate of change of f at the given point and the direction in which it occurs.

$f(x, y) = \sin(xy), \quad (5, 0)$

Step 1

Recall that the direction in which the maximum rate of change of $f(x, y)$ occurs at a point (a, b) is given by the vector $\nabla f(a, b)$. For $f(x, y) = \sin(xy)$, we have

$\nabla f(x, y) =$

$$\langle ycos(xy),xcos(xy)\rangle

✔ .

Step 2

Therefore, at the point $(5, 0)$, the direction of maximum rate of change is the vector

$\nabla f(5, 0) = \langle 0 \cdot \cos(0), 5 \cdot \cos(0)\rangle =$

$$\langle 0,5\rangle

✔ .

The maximum rate of change is given by $|\nabla f(a, b)|$, which is

$|\nabla f(5, 0)| =$

$$5

✔ .

You have now completed the Master It.

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7. 1/1 POINTS | PREVIOUS ANSWERS | SCALCET8 14.6.029.MI. | MY NOTES | ASK YOUR TEACHER

Find all points at which the direction of fastest change of the function $f(x, y) = x^2 + y^2 - 2x - 8y$ is $\mathbf{i} + \mathbf{j}$. (Enter your answer as an equation.)

$$y=x+3

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8. 2/0 POINTS | PREVIOUS ANSWERS | SCALCET8 14.6.035. | MY NOTES | ASK YOUR TEACHER

Let f be a function of two variables that has continuous partial derivatives and consider the points $A(8, 4)$, $B(12, 4)$, $C(8, 7)$, and $D(14, 12)$. The directional derivative of f at A in the direction of the vector $\overrightarrow{AB}$ is 3 and the directional derivative at A in the direction of $\overrightarrow{AC}$ is 3. Find the directional derivative of f at A in the direction of the vector $\overrightarrow{AD}$. (Round your answer to two decimal places.)

4.2

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9. 2/1 POINTS | PREVIOUS ANSWERS | SCALCET8 14.6.041. | MY NOTES | ASK YOUR TEACHER

Find equations of the following.

$2(x - 1)^2 + (y - 9)^2 + (z - 9)^2 = 10, \quad (2, 11, 11)$

(a) the tangent plane

$$x+y+z=24

(b) the normal line

$$2+4t,11+4t,11+4t

$(x(t), y(t), z(t)) =$

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10. 2/2 POINTS | PREVIOUS ANSWERS | SCALCET8 14.6.045. | MY NOTES | ASK YOUR TEACHER

Find equations of the tangent plane and the normal line to the given surface at the specified point.

$x + y + z = 8e^{xyz}$, (0, 0, 8)

(a) the tangent plane

$$x+y+z=8

(b) the normal line

$(x(t), y(t), z(t)) =$ (

$$t,t,8+t

)

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11. 2/2 POINTS | PREVIOUS ANSWERS | SCALCET8 14.6.523.XP. | MY NOTES | ASK YOUR TEACHER

Find equations of the following.

$yz = 5\ln(x + z)$, (0, 0, 1)

(a) the tangent plane

$$5x−y+5z=5

(b) parametric equations of the normal line to the given surface at the specified point. (Enter your answer as a comma-separated list of equations. Let x, y, and z be in terms of t.)

$$x=5t, y=−t, z=1+5t

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12. 2.1/0 POINTS | PREVIOUS ANSWERS | WAS SCALCET8 14.6.AE.008. | MY NOTES | ASK YOUR TEACHER

Video Example

EXAMPLE 8 Find the equations of the tangent plane and normal line at the point $(-2, 1, -5)$ to the ellipsoid

$$\frac{x^2}{4} + y^2 + \frac{z^2}{25} = 3.$$

SOLUTION The ellipsoid is the level surface (with $k = 3$) of the function

$$F(x, y, z) = \frac{x^2}{4} + y^2 + \frac{z^2}{25}.$$

Therefore, we have

$$F_x(x, y, z) = \text{\$\$x2}$$

$$F_y(x, y, z) = 2y$$

$$F_z(x, y, z) = \text{\$\$2z25}$$

$$F_x(-2, 1, -5) = \boxed{-1}$$

$$F_y(-2, 1, -5) = 2$$

$$F_z(-2, 1, -5) = \boxed{-2/5} \ .$$

Then this theorem gives the equation of the tangent plane at $(-2, 1, -5)$ as

$$-1(x + 2) + 2(y - 1) - \left(\boxed{2/5}\right)(z + 5) = 0$$

$$5x - \text{\$\$10y}$$

which simplifies to + 2z + 30 = 0. By this theorem, symmetric equations of the normal line are

$$\frac{x + 2}{-1} = \frac{y - 1}{2} = \text{\$\$-5z+252}$$

.

13. 2/3 POINTS | PREVIOUS ANSWERS | SCALCET8 14.7.006. | MY NOTES | ASK YOUR TEACHER

Find the local maximum and minimum values and saddle point(s) of the function. If you have three-dimensional graphing software, graph the function with a domain and viewpoint that reveal all the important aspects of the function. (Enter your answers as a comma-separated list. If an answer does not exist, enter DNE.)

$f(x, y) = xy - 3x - 3y - x^2 - y^2$

$$−3

local maximum value(s)

✗

$$DNE

local minimum value(s)

✓

$$DNE

saddle point(s) $(x, y, f) =$

✓

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14. 1/0 POINTS | PREVIOUS ANSWERS | SCALCET8 14.7.014. | MY NOTES | ASK YOUR TEACHER

Find the local maximum and minimum values and saddle point(s) of the function. If you have three-dimensional graphing software, graph the function with a domain and viewpoint that reveal all the important aspects of the function. (Enter your answers as a comma-separated list. If an answer does not exist, enter DNE.)

$f(x, y) = 4y \cos(x), \quad 0 \le x \le 2\pi$

$$DNE

local maximum value(s)

✓

$$DNE

local minimum value(s)

✓

$$(3п2, 0, 0)

saddle point(s) $(x, y, f) =$

✗

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15. 3/3 POINTS | PREVIOUS ANSWERS | SCALCET8 14.7.504.XP. | MY NOTES | ASK YOUR TEACHER

Find the local maximum and minimum values and saddle point(s) of the function. If you have three-dimensional graphing software, graph the function with a domain and viewpoint that reveal all the important aspects of the function. (Enter your answers as a comma-separated list. If an answer does not exist, enter DNE.)

$f(x, y) = 2e^y(y^2 - x^2)$

local maximum value(s) $$8e2

local minimum value(s) $$DNE

saddle point(s) $(x, y, f) =$ $$(0,0,0)

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16. 3/3 POINTS | PREVIOUS ANSWERS | SCALCET8 14.7.025. | MY NOTES | ASK YOUR TEACHER

Use a graph or level curves or both to find the local maximum and minimum values and saddle points of the function. Then use calculus to find these values precisely. (Enter your answers as a comma-separated list. If an answer does not exist, enter DNE.)

$f(x, y) = \sin(x) + \sin(y) + \sin(x + y) + 5, \quad 0 \le x \le 2\pi, \quad 0 \le y \le 2\pi$

local maximum value(s) $$5+3\sqrt{32}

local minimum value(s) $$5-3\sqrt{32}

saddle point(s) $(x, y, f) =$ $$(\pi,\pi,5)

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17. 2/2 POINTS | PREVIOUS ANSWERS | SCALCET8 14.8.003. | MY NOTES | ASK YOUR TEACHER

This extreme value problem has a solution with both a maximum value and a minimum value. Use Lagrange multipliers to find the extreme values of the function subject to the given constraint.

$f(x, y) = x^2 - y^2; \quad x^2 + y^2 = 49$

$$49

maximum value

$$-49

minimum value

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18. 2/2 POINTS | PREVIOUS ANSWERS | SCALCET8 14.8.013. | MY NOTES | ASK YOUR TEACHER

This extreme value problem has a solution with both a maximum value and a minimum value. Use Lagrange multipliers to find the extreme values of the function subject to the given constraint.

$f(x, y, z, t) = x + y + z + t; \quad x^2 + y^2 + z^2 + t^2 = 9$

$$6

maximum value

$$-6

minimum value

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19. 3.5/3.5 POINTS | PREVIOUS ANSWERS | SCALCET8 14.8.029. | MY NOTES | ASK YOUR TEACHER

Use Lagrange multipliers to prove that the rectangle with maximum area that has a given perimeter p is a square.

Let the sides of the rectangle be x and y and let f and g represent the area (A) and perimeter (p), respectively. Find the following.

$A = f(x, y) =$ $$xy

$p = g(x, y) =$ $$2x+2y

$\nabla f(x, y) =$ $$yi+xj

$\lambda \nabla g =$ $$2\lambda i+2\lambda j

$\lambda = \frac{1}{2}y =$ $$x2

Then ✓ implies that $x =$ $$y

✓ .

Therefore, the rectangle with maximum area is a square with side length $$p4

✓ .

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20. 2/0 POINTS | PREVIOUS ANSWERS | SCALCET8 14.8.019. | MY NOTES | ASK YOUR TEACHER

Find the extreme values of f subject to both constraints. (If an answer does not exist, enter DNE.)

$f(x, y, z) = yz + xy; \quad xy = 1, \quad y^2 + z^2 = 81$

$$832

maximum

$$-792

minimum

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21. 1/1 POINTS | PREVIOUS ANSWERS | SCALCET8 14.8.038. | MY NOTES | ASK YOUR TEACHER

Use Lagrange multipliers to find the dimensions of the box with volume 343 cm^3 that has minimal surface area. (Enter the dimensions (in centimeters) as a comma separated list.)

$$7,7,7

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22. 2/0 POINTS | PREVIOUS ANSWERS | SCALCET8 14.8.506.XP.MI. | MY NOTES | ASK YOUR TEACHER

Find the extreme values of f subject to both constraints. (If an answer does not exist, enter DNE.)

$f(x, y, z) = x + 2y; \quad x + y + z = 1, \quad y^2 + z^2 = 4$

$$1+2\sqrt{2}

maximum

$$1-2\sqrt{2}

minimum

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