







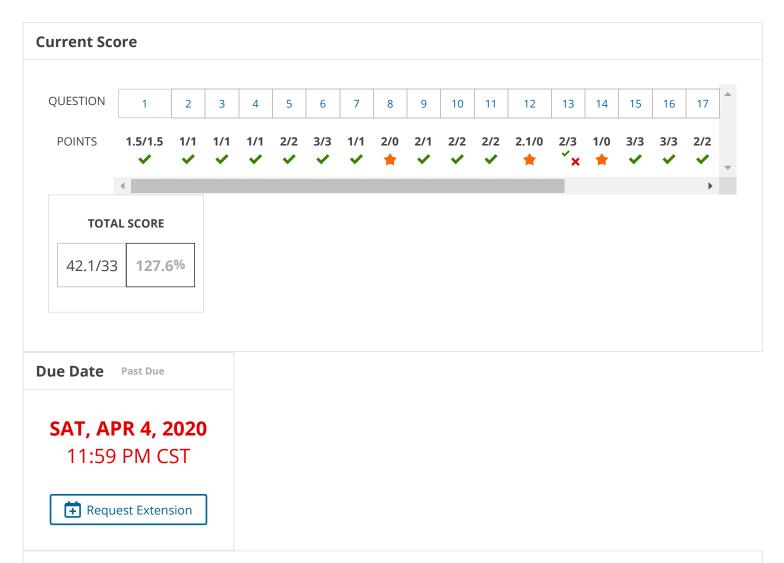
danielcabrera@ufm.edu (sign out)

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← MC 113, section B, Spring 2020

INSTRUCTOR
Christiaan Ketelaar
Universidad Francisco
Marroquin

14.6 Derivada Direccional y 14.7-14.8 Optimizacion (Homework)



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

1.5/1.5 POINTS 1.

PREVIOUS ANSWERS

SCALCET8 14.6.007.

MY NOTES

ASK YOUR TEACHER

Consider the following.

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

(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} .

1/1 POINTS 2.

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 ${f v}$.

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

 $D_{\mathbf{v}} f(0, \pi/3) =$
 $\$\$12 - 9\sqrt{3}10$

Need Help? Watch It

Talk to a Tutor

1/1 POINTS 3.

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 .

$$f(x, y) = xy^3 - x^2$$
, (1, 4), $\theta = \pi/3$
 $D_{\mathbf{u}}f(1, 4) = $$31+24\sqrt{3}$

Need Help? Talk to a Tutor

1/1 POINTS

PREVIOUS ANSWERS

SCALCET8 14.6.015.

MY NOTES

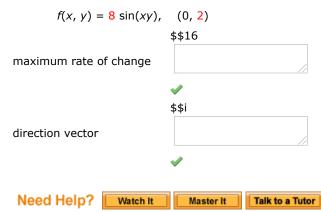
ASK YOUR TEACHER

Find the directional derivative of the function at the given point in the direction of the vector ${f v}$.

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

5. 2/2 POINTS PREVIOUS ANSWERS SCALCETS 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.



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

$$\nabla f(x, y) =$$

$$\$\$(y\cos(xy),x\cos(xy))$$

Step 2

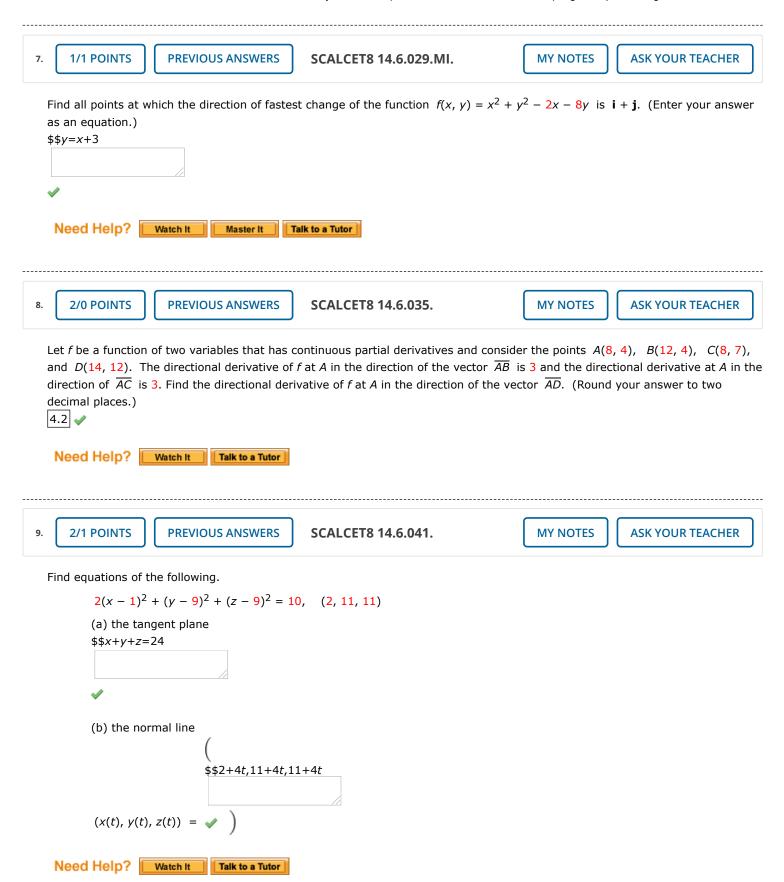
Therefore, at the point (5, 0), the direction of maximum rate of change is the vector

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

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

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

You have now completed the Master It.



2/2 POINTS 10.

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





(b) the normal line

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

$$\$\$t, t, 8+t$$

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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



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



12. 2.1/0 POINTS

PREVIOUS ANSWERS

WAS SCALCET8 14.6.AE.008.

MY NOTES

ASK YOUR TEACHER

Video Example (1)

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

$$F_{X}(x, y, z) = \begin{cases} \$ x 2 \\ F_{Y}(x, y, z) = \end{cases}$$

$$F_{Y}(x, y, z) = 2y$$

$$\$ \$ 2z 25$$

$$F_{Z}(x, y, z) = \begin{cases} F_{Z}(x, y, z) = \\ F_{Z}(x, y, z) = \end{cases}$$

$$F_{X}(-2, 1, -5) = -1$$

$$F_{Y}(-2, 1, -5) = 2$$

$$F_{Z}(-2, 1, -5) = [-2/5] \checkmark .$$

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

$$-1(x + 2) + 2(y - 1) - (2/5) (z + 5) = 0$$

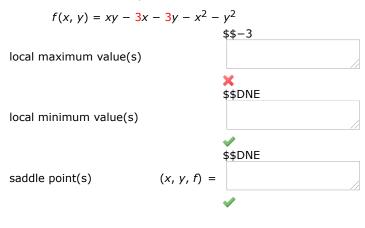
$$5x -$$
\$\$10y

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

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

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

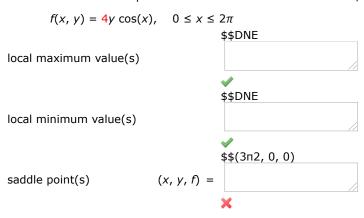
Find the local maximum and minimum values and saddle point(s) of the function. If you have three-dimensional graphing software, graph the function with a domain and viewpoint that reveal all the important aspects of the function. (Enter your answers as a comma-separated list. If an answer does not exist,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



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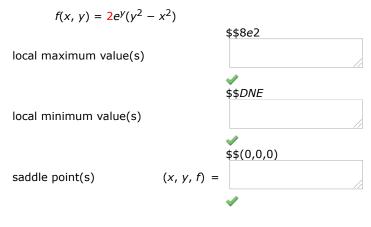
14. 1/0 POINTS PREVIOUS ANSWERS SCALCETS 14.7.014. MY NOTES ASK YOUR TEACHER

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.)



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

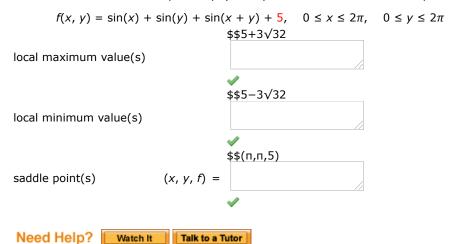
Find the local maximum and minimum values and saddle point(s) of the function. If you have three-dimensional graphing software, graph the function with a domain and viewpoint that reveal all the important aspects of the function. (Enter your answers as a comma-separated list. If an answer does not exist,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



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16. 3/3 POINTS PREVIOUS ANSWERS SCALCETS 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.)



17. 2/2 POINTS PREVIOUS ANSWERS SCALCETS 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.

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

maximum value

\$\$\$-49

minimum value

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18. 2/2 POINTS PREVIOUS ANSWERS SCALCETS 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
$$\$$$
Need Help? Watch it Talk to a Tutor

3.5/3.5 POINTS 19.

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.

$$A = f(x, y) = \begin{cases} \$\$xy \\ \$\$2x + 2y \end{cases}$$

$$p = g(x, y) = \begin{cases} \$\$yi + xj \\ \nabla f(x, y) = \end{cases}$$

$$\$\$2\lambda i + 2\lambda j$$

$$\lambda \nabla g = \begin{cases} \lambda \nabla g = \delta \end{cases}$$

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

$$$$x2$$

Then 🥒

implies that x =

\$\$*y*

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

14.6 Derivada Direccional y 14.7-14.8 Optimizacion - MC 113, section B, Spring 2020 | WebAssign 5/9/2020 2/0 POINTS **SCALCET8 14.8.019. PREVIOUS ANSWERS MY NOTES ASK YOUR TEACHER** 20. Find the extreme values of f subject to both constraints. (If an answer does not exist, enter DNE.) f(x, y, z) = yz + xy; xy = 1, $y^2 + z^2 = 81$ \$\$832 maximum \$\$-792 minimum Need Help? Talk to a Tutor Watch It 1/1 POINTS **PREVIOUS ANSWERS MY NOTES ASK YOUR TEACHER** SCALCET8 14.8.038. 21. Use Lagrange multipliers to find the dimensions of the box with volume 343 cm³ that has minimal surface area. (Enter the dimensions (in centimeters) as a comma separated list.) \$\$7,7,7 Need Help? Talk to a Tutor 2/0 POINTS **PREVIOUS ANSWERS** SCALCET8 14.8.506.XP.MI. **MY NOTES ASK YOUR TEACHER** 22. Find the extreme values of f subject to both constraints. (If an answer does not exist, enter DNE.) f(x, y, z) = x + 2y; x + y + z = 1, $y^2 + z^2 = 4$ **\$\$1+2√2** maximum \$\$1-2√2 minimum Need Help?

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