Sections 14.6 and 14.7 (1482266)

1. Question Details SCalcET6 14.6.012. [1289020]
   Find the directional derivative, \( D_u f \), of the function at the given point in the direction of vector \( \mathbf{v} \).
   \[
   f(x, y) = 6 \ln(x^2 + y^2), \ (4, 5), \ \mathbf{v} = <-5, 4> 
   \]
   \( D_u f(4, 5) = \) 

2. Question Details SCalcET6 14.6.010. [1289634]
   \( f(x, y, z) = \sqrt{x + yz}, \ P(1, 3, 1), \ \mathbf{u} = <3/7, 2/7, 6/7> \)
   (a) Find the gradient of \( f \).
   \[
   \nabla f(x, y, z) = < , , > 
   \]
   (b) Evaluate the gradient at the point \( P \).
   \[
   \nabla f(1, 3, 1) = < , , > 
   \]
   (c) Find the rate of change of \( f \) at \( P \) in the direction of the vector \( \mathbf{u} \).
   \( D_uf(1, 3, 1) = \) 

3. Question Details SCalcET6 14.6.006. [1288966]
   Find the directional derivative of \( f \) at the given point in the direction indicated by the angle \( \theta \).
   \[
   f(x, y) = 3x \sin(xy), \ (4, 0), \ \theta = \pi/3 
   \]
   \( D_uf = \) 

4. Question Details SCalcET6 14.6.022. [1288311]
   Find the maximum rate of change of \( f \) at the given point and the direction in which it occurs.
   \( f(p, q) = 3qe^p + 2pe^{-q}, \ (0, 0) \)
   direction of maximum rate of change (in unit vector) = < , , > 
   maximum rate of change = 

5. Question Details SCalcET6 14.6.021. [1288757]
   Find the maximum rate of change of \( f \) at the given point and the direction in which it occurs.
   \( f(x, y) = \frac{3y^2}{x}, \ (2, 4) \)
   direction of maximum rate of change (in unit vector) = < , , > 
   maximum rate of change = 

6. Question Details SCalcET6 14.6.025. [1289820]
   Find the maximum rate of change of \( f \) at the given point and the direction in which it occurs.
   \( f(x, y, z) = \sqrt{x^2 + y^2 + z^2}, \ (-2, -1, -2) \)
   direction of maximum rate of change (in unit vector) = < , , > 
   maximum rate of change = 

7. Question Details SCalcET6 14.6.027. [824767]
   (a) Show that a differentiable function \( f \) decreases most rapidly at \( \mathbf{x} \) in the direction opposite the gradient vector, that is, in the direction of \( -\nabla f(\mathbf{x}) \). (Do this on paper. Your instructor may ask you to turn in this work.)
   (b) Use the result of part (a) to find the direction in which the function \( f(x, y) = x^4y - x^3y^3 \) decreases fastest at the point \((-1, 3)\).
8. Question Details  
**SCalcET6 14.6.031.**  
The temperature $T$ in a metal ball is inversely proportional to the distance from the center of the ball, which we take to be the origin. The temperature at the point $(2, 4, 4)$ is $110^\circ$.  
(a) Find the rate of change of $T$, $D_u T$, at $(2, 4, 4)$ in the direction toward the point $(6, 1, 8)$.  
$$D_u T(2, 4, 4) =$$

(b) Show that at any in the ball the direction of greatest increase in temperature is given by a vector that points towards the origin. (Do this on paper. Your instructor may ask you to turn in this work.)

9. Question Details  
**SCalcET6 14.6.033.**  
Suppose that over a certain region of space the electrical potential $V$ is given by the following equation.  
$$V(x, y, z) = 7x^2 - 8xy + xyz$$

(a) Find the rate of change of the potential at $P(2, 2, 9)$ in the direction of the vector $v = i + j - k$.  

(b) In which direction does $V$ change most rapidly at $P$?  
$$< 30, \quad , \quad >$$

(c) What is the maximum rate of change at $P$?

10. Question Details  
**SCalcET6 14.6.039.**  
Find equations of the following.  
$$3(x - 3)^2 + (y - 1)^2 + (z - 1)^2 = 21 \quad , \quad (4, 4, 4)$$

(a) the tangent plane

(b) the normal line to the given surface at the specified point. (Enter your answer in terms of $t$.)
$$x = t + 4$$
$$y =$$
$$z =$$

11. Question Details  
**SCalcET6 14.6.040.**  
Find equations of the following.  
$$y = x^2 - z^2 \quad , \quad (8, 39, 5)$$

(a) the tangent plane

(b) the normal line to the given surface at the specified point. (Enter your answer in terms of $t$.)
$$x = 16 t + 8$$
$$y =$$
$$z =$$

12. Question Details  
**SCalcET6 14.6.048.**  
If $g(x, y) = x^2 + y^2 - 6x$, find the gradient vector $\nabla g(1, 3)$ and use it to find the tangent line to the level curve $g(x, y) = 4$ at the point $(1, 3)$.  

13. Sketch the level curve, the tangent line, and the gradient vector. (Do this on paper. Your instructor may ask you to turn in this work.)

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 NONE in any unused answer blanks.)

\[ f(x, y) = 2x^3 + xy^2 + 5x^2 + y^3 + 3 \]

maximum
\[ f(\quad, \quad) = \quad \text{(smaller } x \text{ value)} \]
\[ f(\quad, \quad) = \quad \text{(larger } x \text{ value)} \]

minimum
\[ f(\quad, \quad) = \quad \text{(smaller } x \text{ value)} \]
\[ f(\quad, \quad) = \quad \text{(larger } x \text{ value)} \]

saddle points
( \quad, \quad ) \text{(smallest } x \text{ value, smallest } y \text{ value)}
( \quad, \quad ) \text{(largest } x \text{ value, largest } y \text{ value)}

14. 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 NONE in any unused answer blanks.)

\[ f(x, y) = xy + \frac{27}{x} + \frac{27}{y} \]

maximum
\[ f(\quad, \quad) = \quad \text{(smaller } x \text{ value)} \]
\[ f(\quad, \quad) = \quad \text{(larger } x \text{ value)} \]

minimum
\[ f(\quad, \quad) = \quad \text{(smaller } x \text{ value)} \]
\[ f(\quad, \quad) = \quad \text{(larger } x \text{ value)} \]

saddle points
( \quad, \quad ) \text{(smallest } x \text{ value)}
( \quad, \quad ) \text{(largest } x \text{ value)}

15. 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 NONE in any unused answer blanks.)

\[ f(x, y) = y^2 - 2y \cos(x), -1 \leq x \leq 7 \]

maximum
\[ f(\quad, \quad) = \quad \text{(smallest } x \text{ value)} \]
\[ f(\quad, \quad) = \quad \text{(largest } x \text{ value)} \]

minimum
\[ f(\quad, \quad) = \quad \text{(smallest } x \text{ value)} \]
\[ f(\quad, \quad) = \quad \text{(largest } x \text{ value)} \]

saddle points
( \quad, \quad ) \text{(smallest } x \text{ value)}
( \quad, \quad ) \text{(largest } x \text{ value)}

16. 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 NONE in any unused answer blanks.)

\[ f(x, y) = \quad \text{(smaller } x \text{ value)} \]
\[ f(\quad, \quad) = \quad \text{(largest } x \text{ value)} \]

minimum
\[ f(\quad, \quad) = \quad \text{(smallest } x \text{ value)} \]
\[ f(\quad, \quad) = \quad \text{(largest } x \text{ value)} \]

saddle points
( \quad, \quad ) \text{(smallest } x \text{ value)}
( \quad, \quad ) \text{(largest } x \text{ value)}
Find the absolute maximum and minimum values of \( f \) on the set \( D \).
\[ f(x, y) = 8 + 4x - 5y, \quad D \text{ is the closed triangular region with vertices (0, 0), (2, 0), and (0, 3)} \]
maximum
minimum

17. Question Details 14.7.031. [824696]
Find the absolute maximum and minimum values of \( f \) on the set \( D \).
\[ f(x, y) = x^2 + y^2 + x^2y + 5 \]
\[ D = \{(x, y) \mid |x| \leq 1, |y| \leq 1\} \]
maximum
minimum

18. Question Details 14.7.039.MI. [1387826]
Find the shortest distance from the point (3, 4, -7) to the plane \( x + y - z = 7 \).

19. Question Details 14.7.036. [824726]
Find the absolute maximum and minimum values of \( f \) on the set \( D \).
\[ f(x, y) = x^3 - 3x - y^3 + 12y + 2 \]
\[ D \text{ is quadrilateral whose vertices are (-2, 3), (2, 3), (2, 2), and (-2, -2).} \]
maximum
minimum

20. Question Details 14.7.041. [1289104]
Find the points on the cone \( z^2 = x^2 + y^2 \) that are closest to the point (6, 2, 0). (Enter your answers from smallest to largest value of the \( z \)-value.)

21. Question Details 14.7.048. [824725]
Find the dimensions of the rectangular box with largest volume if the total surface area is given as 96 cm\(^2\).

22. Question Details 14.7.049. [824704]
Find the dimensions of a rectangular box of maximum volume such that the sum of the lengths of its 12 edges is a constant \( c \).

Feedback Settings
Before due date
After due date
Question Score
Question Score
Assignment Score
Assignment Score

Assignment Details
Name (AID): Sections 14.6 and 14.7 (1482266)
Submissions Allowed: 5
Category: Homework
Code:
Locked: No
<table>
<thead>
<tr>
<th>Action</th>
<th>Icon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Publish Essay Scores</td>
<td></td>
</tr>
<tr>
<td>Question Part Score</td>
<td></td>
</tr>
<tr>
<td>Mark</td>
<td></td>
</tr>
<tr>
<td>Add Practice Button</td>
<td></td>
</tr>
<tr>
<td>Help/Hints</td>
<td></td>
</tr>
<tr>
<td>Response</td>
<td></td>
</tr>
<tr>
<td>Save Work</td>
<td></td>
</tr>
</tbody>
</table>