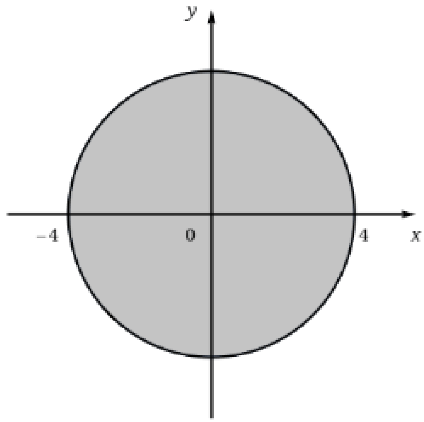
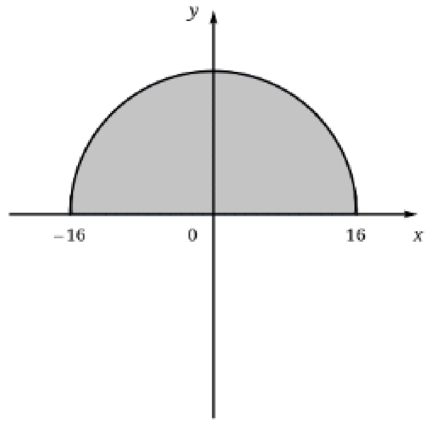
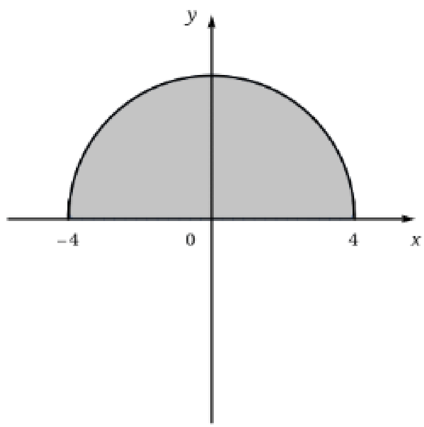
1. [–/1 Points] DETAILS SCALC8 14.1.504.XP.

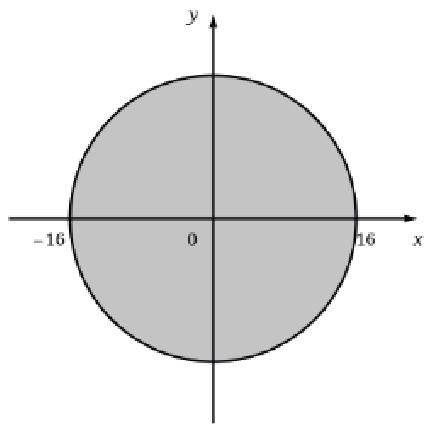
Find and sketch the domain of the function.

$f(x, y) = \sqrt{y} + \sqrt{16 - x^2 - y^2}$





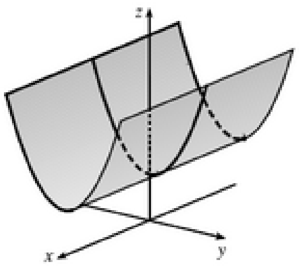




2. [–/1 Points] DETAILS SCALC8 14.1.031.

Sketch the graph of the function.

$f(x, y) = \sqrt{4 - 4x^2 - y^2}$



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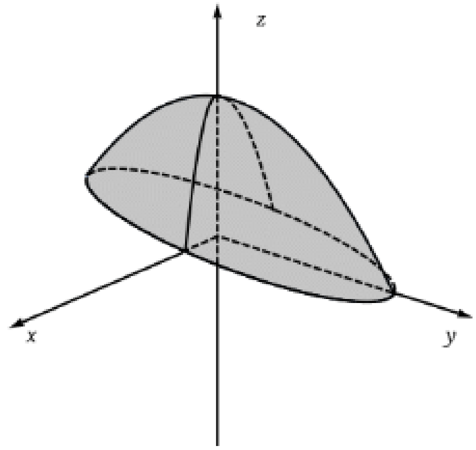

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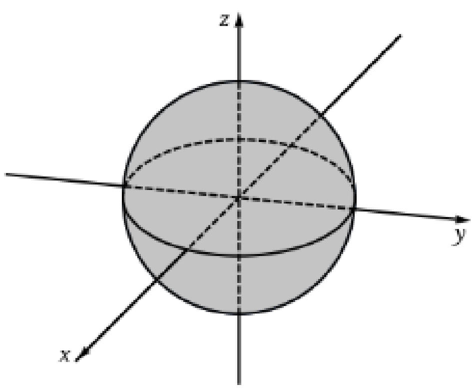

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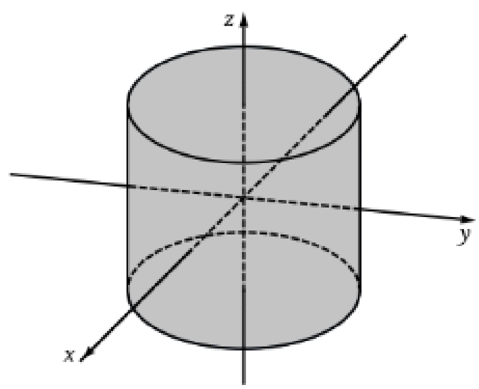

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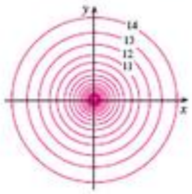
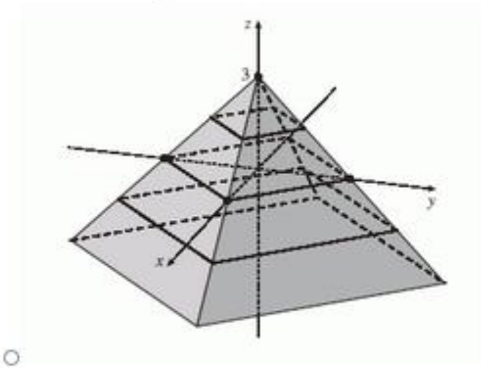
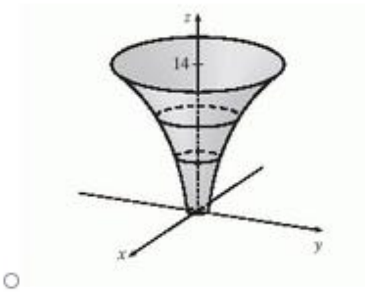
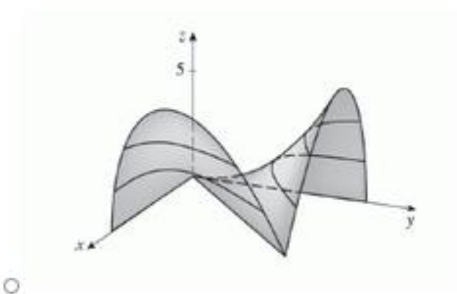
3. [–/1 Points] DETAILS **SCALC8 14.1.041.**

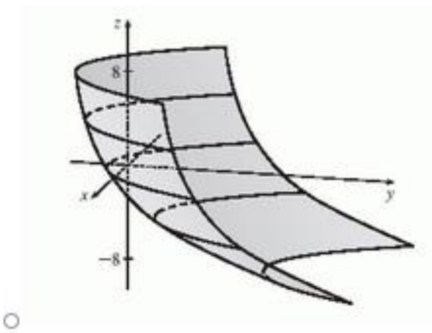
A contour map of a function is shown. Use it to make a rough sketch of the graph of *f*.



○ 

○ 

○ 

○ 

4. [–/1 Points] DETAILS **SCALC8 14.1.070.**

Describe the level surfaces of the function.

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

- ○ The level surfaces are a family of ellipsoids.
- ○ The level surfaces are a family of parallel planes.
- ○ The level surfaces are a family of hyperbolic cylinders.
- ○ The level surfaces are a family of hyperboloids.

5. [–/3 Points] DETAILS **SCALC8 14.2.JIT.005.**

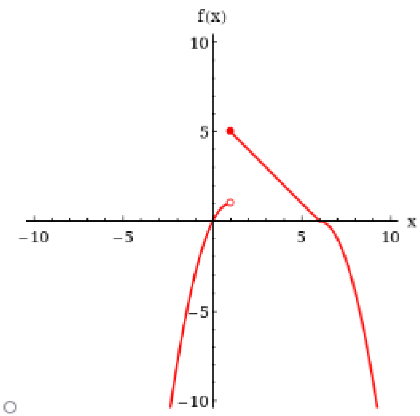
Find the x-value at which f is discontinuous and determine whether f is continuous from the right, or from the left, or neither.

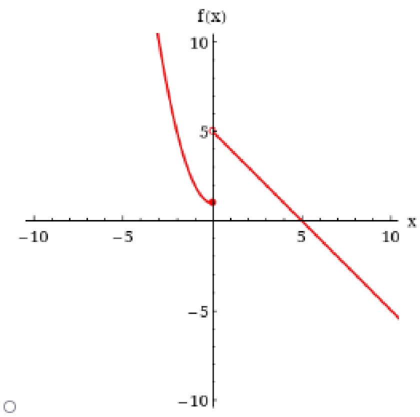
$$f(x) = \begin{cases} 1 + x^2 & \text{if } x \le 0 \\ 5 - x & \text{if } 0 < x \le 5 \\ (x - 5)^2 & \text{if } x > 5 \end{cases}$$

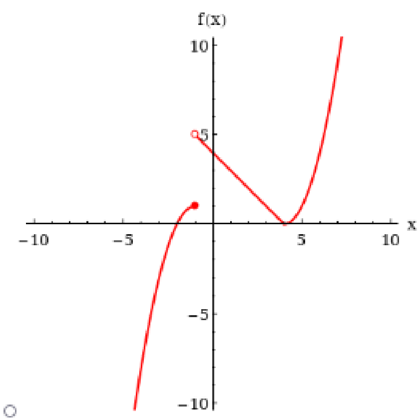
x = [ ]

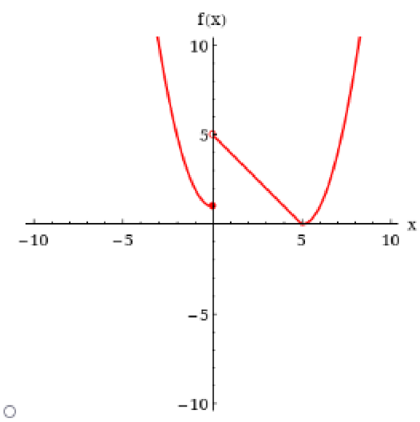
- ○ continuous from the right
- ○ continuous from the left
- ○ neither

Sketch the graph of f.

○ 

○ 

○ 

○ 

6. [–/1 Points] DETAILS **SCALC8 14.2.503.XP.**

Find the limit, if it exists. (If an answer does not exist, enter DNE.)

$$\lim_{(x,\, y) \to (2,\, 2)} \frac{5 - xy}{x^2 + 7y^2}$$

[ ]

7. [–/1 Points] DETAILS **SCALC8 14.2.507.XP.**

Find the limit, if it exists. (If an answer does not exist, enter DNE.)

$$\lim_{(x,\, y) \to (0,\, 0)} \frac{x^2 \sin^2(y)}{x^2 + 3y^2}$$

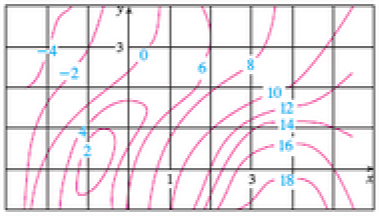
[ ]

8. [–/1 Points] DETAILS **SCALC8 14.3.010.**

A contour map is given for a function f. Use it to estimate $f_x(2, 1)$ and $f_y(2, 1)$.

$f_x(2, 1) =$ ______

$f_y(2, 1) =$ ______



9. [–/1 Points] DETAILS **SCALC8 14.3.504.XP.**

Find the first partial derivatives of the function.

$$f(x, t) = \sqrt{x}\,\ln(t)$$

$f_x(x, t) =$ ______

$f_t(x, t) =$ ______

10. [–/1 Points] DETAILS **SCALC8 14.4.507.XP.**

Find an equation of the tangent plane to the given surface at the specified point.

$z = y\ln(x),\ (1, 8, 0)$

______

11. [–/6 Points] DETAILS **SCALC8 14.4.011.**

Explain why the function is differentiable at the given point.

$f(x, y) = 3 + x\ln(xy - 9), \quad (2, 5)$

The partial derivatives are $f_x(x, y) =$ ______ and $f_y(x, y) =$ ______ , so $f_x(2, 5) =$ ______ and $f_y(2, 5) =$ ______ . Both f_x and f_y are continuous functions for $xy >$ ______ and f is differentiable at $(2, 5)$.

Find the linearization $L(x, y)$ of $f(x, y)$ at $(2, 5)$.

$L(x, y) =$ ______

12. [–/1 Points] DETAILS **SCALC8 14.4.510.XP.**

Find the linear approximation of the function below at the indicated point.

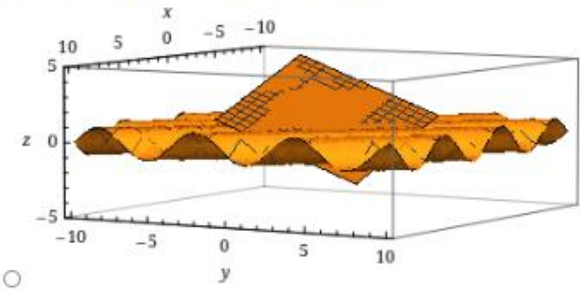
$f(x, y) = \ln(x - 5y)$ at $(11, 2)$

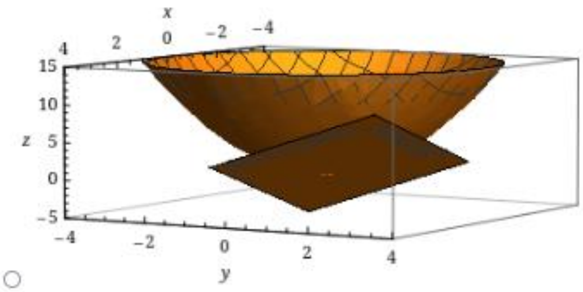
$f(x, y) \approx$ [ ]

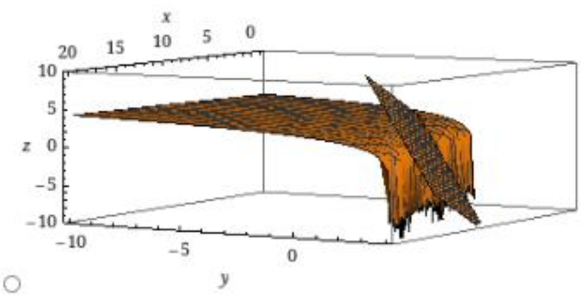
Use the approximation to find $f(10.9, 2.1)$. (Round your answer to three decimal places.)

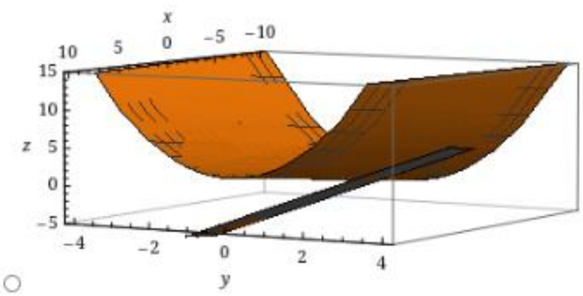
$f(10.9, 2.1) \approx$ [ ]

Illustrate by graphing f and the tangent plane.

○ 

○ 

○ 

○ 

13. [–/1 Points] DETAILS **SCALC8 14.4.514.XP.**

The dimensions of a closed rectangular box are measured as 93 cm, 63 cm, and 38 cm, respectively, with a possible error of 0.2 cm in each dimension.

Use differentials to estimate the maximum error in calculating the surface area of the box. (Round your answer to one decimal place.)

[ ] cm^2

14. [–/1 Points] DETAILS **SCALC8 14.5.503.XP.**

Use the Chain Rule to find dz/dt.

$z = \sqrt{1 + x^2 + y^2}$, $x = 6\ln(t)$, $y = \cos(t)$

$\frac{dz}{dt} =$ [ ]

15. [–/1 Points] DETAILS **SCALC8 14.5.507.XP.**

Use the Chain Rule to find $\partial z/\partial s$ and $\partial z/\partial t$.

$z = \sin(\theta)\cos(\varphi), \quad \theta = st^5, \quad \varphi = s^9 t$

$\frac{\partial z}{\partial s} =$ ______

$\frac{\partial z}{\partial t} =$ ______

16. [–/1 Points] DETAILS **SCALC8 14.5.031.**

Use the equations to find $\partial z/\partial x$ and $\partial z/\partial y$.

$x^2 + 4y^2 + 5z^2 = 1$

$\frac{\partial z}{\partial x} =$ ______

$\frac{\partial z}{\partial y} =$ ______

17. [–/1 Points] DETAILS **SCALC8 14.5.041.**

The pressure of 1 mole of an ideal gas is increasing at a rate of 0.06 kPa/s and the temperature is increasing at a rate of 0.14 K/s. Use the equation $PV = 8.31T$ to find the rate of change of the volume when the pressure is 18 kPa and the temperature is 327 K. (Round your answer to two decimal places.) ______ L/s

18. [–/1 Points] DETAILS **SCALC8 14.6.011.**

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

$f(x, y) = 3e^x \sin(y), \quad (0, \pi/3), \quad \mathbf{v} = \langle -3, 4 \rangle$

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

19. [–/1 Points] DETAILS **SCALC8 14.6.017.**

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

$h(r, s, t) = \ln(3r + 6s + 9t), \quad (1, 1, 1), \quad \mathbf{v} = 12\mathbf{i} + 36\mathbf{j} + 18\mathbf{k}$

$D_{\mathbf{v}} h(1, 1, 1) =$ ______

20. [–/1 Points] DETAILS **SCALC8 14.6.517.XP.**

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

$f(x, y) = 3y^2/x, \quad (2, 6)$

maximum rate of change ______

direction ______

21. [–/1 Points] DETAILS **SCALC8 14.6.055.**

Find any points on the hyperboloid $x^2 - y^2 - z^2 = 6$ where the tangent plane is parallel to the plane $z = 4x + 4y$. (If an answer does not exist, enter DNE.)

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

22. [–/11 Points] DETAILS **SCALC8 14.7.020.**

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.)

$f(x, y) = 6 \sin(x) \sin(y), \quad -\pi < x < \pi, \quad -\pi < y < \pi$

local maximum value(s) [ ]

local minimum value(s) [ ]

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

Show My Work (Required)

23. [–/1 Points] DETAILS **SCALC8 14.7.515.XP.**

Find the absolute maximum and minimum values of f on the set D.

$f(x, y) = 8 + 4x - 5y$, D is the closed triangular region with vertices (0, 0), (2, 0), and (0, 3)

absolute maximum value [ ]

absolute minimum value [ ]

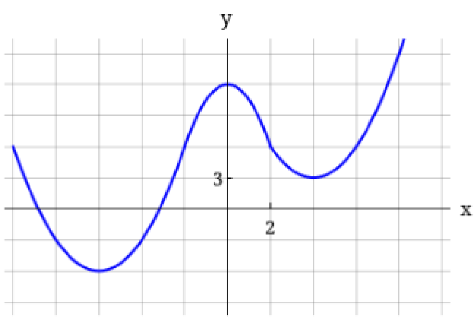
24. [–/1 Points] DETAILS **SCALC8 14.7.051.**

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. (Let x, y, and z be the dimensions of the rectangular box.)

$(x, y, z) =$ ([ ])

25. [–/5 Points] DETAILS **SCALC8 14.7.JIT.001.**

The graph of a function is given.



(a) Find all the local maximum and minimum values of the function as well as the value of x at which each occurs.

local maximum $(x, y) =$ ([ ])

local minimum $(x, y) =$ ([ ]) (smaller x-value)

local minimum $(x, y) =$ ([ ]) (larger x-value)

(b) Find the intervals on which the function is increasing, and on which the function is decreasing. (Enter your answers using interval notation.)

increasing [ ]

decreasing [ ]

26. [–/1 Points] DETAILS **SCALC8 14.8.007.**

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.

$f(x, y, z) = 6x + 6y + 2z; \quad 3x^2 + 3y^2 + 2z^2 = 26$

maximum value [ ]

minimum value [ ]

27. [–/1 Points] DETAILS SCALC8 14.8.038.

Use Lagrange multipliers to find the dimensions of the box with volume 2197 cm^3 that has minimal surface area. (Enter the dimensions (in centimeters) as a comma separated list.)

28. [–/11 Points] DETAILS SCALC8 14.8.032.

Use Lagrange multipliers to find the point on the plane $x - 2y + 3z = 6$ that is closest to the point $(0, 1, 3)$.

$(x, y, z) = (\quad)$

Show My Work (Required)