Math 2013 Practice Quiz 2 Fall 2012

Name: Last _______________, First _______________

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. You must show your work to get credit.

Find the domain and range and describe the level curves for the function f(x,y).

1) $f(x, y) = \sqrt{64 - x^2 - y^2}$ 1) ________

A) Domain: all points in the x–y plane; range: all real numbers; level curves: circles with centers at (0, 0)

B) Domain: all points in the x–y plane satisfying $x^2 + y^2 = 64$; range: real numbers $0 \le z \le 8$; level curves: circles with centers at (0, 0) and radii r, $0 < r \le 8$

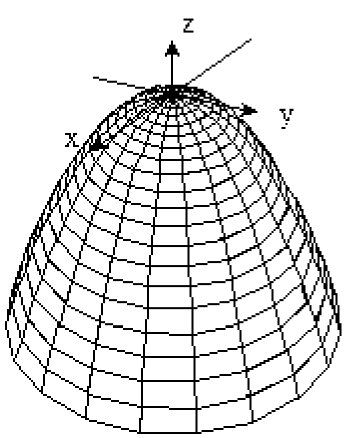
C) Domain: all points in the x–y plane; range: real numbers $0 \le z \le 8$; level curves: circles with centers at(0, 0) and radii r, $0 < r \le 8$

D) Domain: all points in the x–y plane satisfying $x^2 + y^2 \le 64$; range: real numbers $0 \le z \le 8$; level curves: circles with centers at (0, 0) and radii r, $0 < r \le 8$

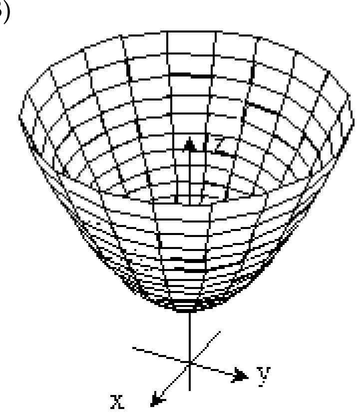
Sketch the surface z = f(x,y).

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

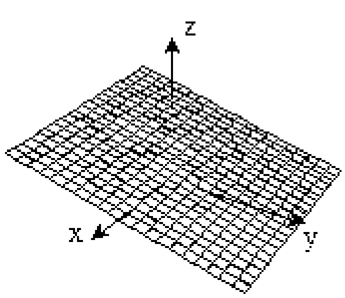
A)



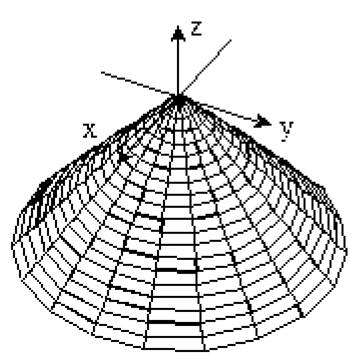
B)



C)



D)



Solve the problem.

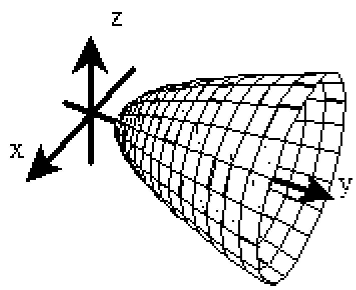
3) Find an equation for the level curve of the function $f(x, y) = 9 - x^2 - y^2$ that passes through the point $\left(\sqrt{5}, \sqrt{7}\right)$. 3) ________

A) $x^2 + y^2 = -12$ B) $x^2 + y^2 = 21$ C) $x^2 - y^2 = 12$ D) $x^2 + y^2 = 12$

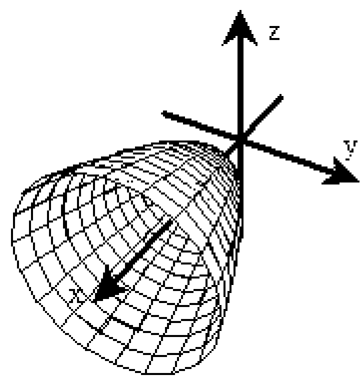
Sketch a typical level surface for the function.

4) $f(x, y, z) = x - y^2 - z^2$ 4) ________

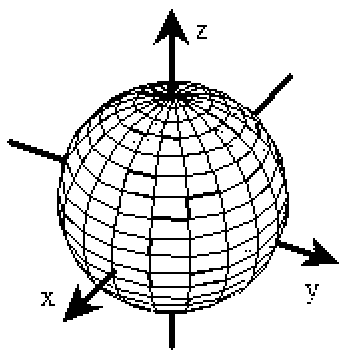
A)



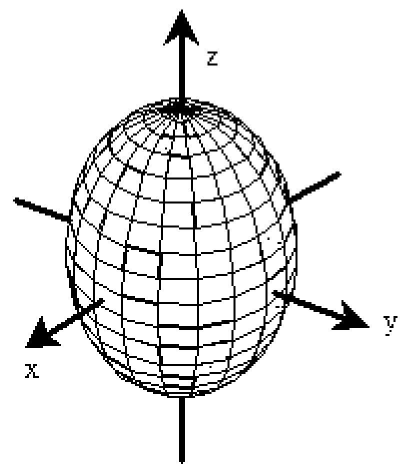
B)



C)



D)



Find the limit.

5) $\lim_{P \to (1, -1, 0)} \dfrac{7xz - 6xy}{x^2 + y^2 - z^2}$ 5) ________

A) 7 B) −6 C) 3 D) −7

At what points is the given function continuous?

6) $f(x, y) = \dfrac{x - y}{2x^2 + x - 6}$ 6) ________

A) All (x, y) such that $x \neq 0$

B) All (x, y) satisfying $x - y \neq 0$

C) All (x, y)

D) All (x, y) such that $x \neq \dfrac{3}{2}$ and $x \neq -2$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Find two paths of approach from which one can conclude that the function has no limit as (x, y) approaches (0, 0).

7) $f(x, y) = \dfrac{y^2}{y^2 - x}$ 7) ________________

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.
You must show your work to get credit.

Find all the first order partial derivatives for the following function.

8) $f(x, y) = \dfrac{1}{\sqrt{x^2 + y^2}}$ 8) ________

A) $\dfrac{\partial f}{\partial x} = \left(\dfrac{x}{2(x^2 + y^2)^{3/2}}\right); \dfrac{\partial f}{\partial y} = \left(\dfrac{y}{2(x^2 + y^2)^{3/2}}\right)$

B) $\dfrac{\partial f}{\partial x} = -\left(\dfrac{x}{2(x^2 + y^2)^{3/2}}\right); \dfrac{\partial f}{\partial y} = -\left(\dfrac{y}{2(x^2 + y^2)^{3/2}}\right)$

C) $\dfrac{\partial f}{\partial x} = -\left(\dfrac{1}{2(x^2 + y^2)^{3/2}}\right); \dfrac{\partial f}{\partial y} = -\left(\dfrac{1}{2(x^2 + y^2)^{3/2}}\right)$

D) $\dfrac{\partial f}{\partial x} = -\left(\dfrac{x}{(x^2 + y^2)^{3/2}}\right); \dfrac{\partial f}{\partial y} = -\left(\dfrac{y}{(x^2 + y^2)^{3/2}}\right)$

9) $f(x, y) = \dfrac{e^{-x}}{x^2 + y^2}$ 9) ________

A) $\dfrac{\partial f}{\partial x} = -\dfrac{e^{-x}(x^2 + y^2 + x)}{(x^2 + y^2)^2}; \dfrac{\partial f}{\partial y} = -\dfrac{ye^{-x}}{(x^2 + y^2)^2}$

B) $\dfrac{\partial f}{\partial x} = -\dfrac{2xe^{-x}}{(x^2 + y^2)^2}; \dfrac{\partial f}{\partial y} = -\dfrac{2ye^{-x}}{(x^2 + y^2)^2}$

C) $\dfrac{\partial f}{\partial x} = \dfrac{e^{-x}(x^2 + y^2 + 2x)}{(x^2 + y^2)^2}; \dfrac{\partial f}{\partial y} = \dfrac{2ye^{-x}}{(x^2 + y^2)^2}$

D) $\dfrac{\partial f}{\partial x} = -\dfrac{e^{-x}(x^2 + y^2 + 2x)}{(x^2 + y^2)^2}; \dfrac{\partial f}{\partial y} = -\dfrac{2ye^{-x}}{(x^2 + y^2)^2}$

10) $f(x, y, z) = \dfrac{\cos y}{xz^2}$ 10) _______

A) $\dfrac{\partial f}{\partial x} = -\dfrac{\cos y}{z^2}; \dfrac{\partial f}{\partial y} = -\dfrac{\sin y}{xz^2}; \dfrac{\partial f}{\partial z} = -\dfrac{2 \cos y}{xz}$

B) $\dfrac{\partial f}{\partial x} = \dfrac{\cos y}{x^2z^2}; \dfrac{\partial f}{\partial y} = \dfrac{\text{siny}}{xz^2}; \dfrac{\partial f}{\partial z} = \dfrac{2 \cos y}{xz^3}$

C) $\dfrac{\partial f}{\partial x} = -\dfrac{\text{cosy}}{x^2z^2}; \dfrac{\partial f}{\partial y} = -\dfrac{\text{siny}}{xz^2}; \dfrac{\partial f}{\partial z} = -\dfrac{2 \cos y}{xz^3}$

D) $\dfrac{\partial f}{\partial x} = \dfrac{\cos y}{z^2}; \dfrac{\partial f}{\partial y} = \dfrac{\sin y}{xz^2}; \dfrac{\partial f}{\partial z} = \dfrac{2 \cos y}{xz}$

Solve the problem.

11) Evaluate $\frac{dw}{dt}$ at $t = \frac{3}{2}\pi$ for the function $w(x, y, z) = \frac{xy}{z}$; $x = \sin t$, $y = \cos t$, $z = t^2$. 11) _______

A) $2\left(\frac{1}{\pi^2}\right)$ B) $-2\left(\frac{1}{\pi}\right)$ C) $-\frac{4}{9}\left(\frac{1}{\pi^2}\right)$ D) $-2\left(\frac{1}{\pi^2}\right)$

12) Evaluate $\frac{\partial u}{\partial z}$ at $(x, y, z) = (5, 4, 5)$ for the function $u(p, q, r) = p^2q^2 - r$; $p = y - z$, $q = x + z$, $r = x + y$. 12) _______

A) -180 B) 440 C) 110 D) 220

Write a chain rule formula for the following derivative.

13) $\frac{\partial w}{\partial t}$ for $w = f(x, y, z)$; $x = g(r, s, t)$, $y = h(r, s, t)$, $z = k(r, s, t)$ 13) _______

A) $\frac{\partial w}{\partial t} = \frac{\partial w}{\partial x}\frac{\partial x}{\partial r} + \frac{\partial w}{\partial y}\frac{\partial y}{\partial s} + \frac{\partial w}{\partial z}\frac{\partial z}{\partial t}$

B) $\frac{\partial w}{\partial t} = \frac{\partial w}{\partial x}\frac{\partial x}{\partial t} + \frac{\partial w}{\partial y}\frac{\partial y}{\partial t} + \frac{\partial w}{\partial z}\frac{\partial z}{\partial t}$

C) $\frac{\partial w}{\partial t} = \frac{\partial w}{\partial x}\frac{\partial x}{\partial t} + \frac{\partial w}{\partial y}\frac{\partial y}{\partial t}$

D) $\frac{\partial w}{\partial t} = \frac{\partial w}{\partial x} + \frac{\partial w}{\partial y} + \frac{\partial w}{\partial z}$

Use implicit differentiation to find the specified derivative at the given point.

14) Find $\frac{dy}{dx}$ at the point (1, 1) for $5x^2 + 5y^3 + 5xy = 0$. 14) _______

A) $-\frac{3}{4}$ B) $\frac{3}{4}$ C) -1 D) $-\frac{3}{2}$

15) Find $\frac{\partial z}{\partial y}$ at the point (8, 1, −1) for $\ln\left(\frac{yz}{x}\right) - e^{xy+z^2} = 0$. 15) _______

A) $\frac{2e^9 - 1}{1 - 8e^9}$ B) $\frac{1 - 8e^9}{1 - 2e^9}$ C) $\frac{8e^9 - 1}{1 - 2e^9}$ D) $\frac{1 - 2e^9}{1 - 8e^9}$

Compute the gradient of the function at the given point.

16) $f(x, y, z) = \ln(x^2 - 5y^2 + 8z^2)$, $(-5, -5, -5)$ 16) _______

A) $-\frac{1}{10}\mathbf{i} + \frac{1}{2}\mathbf{j} - \frac{4}{5}\mathbf{k}$

B) $-\frac{1}{10}\mathbf{i} + \frac{1}{2}\mathbf{j} - \frac{5}{16}\mathbf{k}$

C) $\frac{1}{16}\mathbf{i} + \frac{1}{2}\mathbf{j} - \frac{4}{5}\mathbf{k}$

D) $\frac{1}{16}\mathbf{i} + \frac{1}{2}\mathbf{j} - \frac{5}{16}\mathbf{k}$

Find the derivative of the function at the given point in the direction of A.

17) $f(x, y) = \ln(6x + 10y)$, $(-4, 3)$, $\mathbf{A} = 6\mathbf{i} + 8\mathbf{j}$ 17) _______

A) $\frac{26}{15}$ B) $\frac{23}{15}$ C) $\frac{29}{15}$ D) $\frac{32}{15}$

Solve the problem.

18) Find the derivative of the function $f(x, y) = \tan^{-1} \frac{y}{x}$ at the point $(-7, 7)$ in the direction in which the function decreases most rapidly. 18) _______

A) $-\frac{\sqrt{2}}{21}$ B) $-\frac{\sqrt{2}}{14}$ C) $-\frac{\sqrt{3}}{21}$ D) $-\frac{\sqrt{3}}{14}$

19) Find the derivative of the function $f(x, y) = e^{xy}$ at the point $(0, 4)$ in the direction in which the function increases most rapidly. 19) _______

A) 4 B) 8 C) 3 D) 12

20) Write an equation for the tangent line to the curve $\frac{x^2}{16} + \frac{y^2}{9} = 1$ at the point $\left(\frac{4}{\sqrt{2}}, \frac{3}{\sqrt{2}}\right)$. 20) _______

A) $\frac{x}{3} + \frac{y}{4} = 1$ B) $\frac{x}{4} + \frac{y}{3} = 1$ C) $\frac{x}{3} + \frac{y}{4} = \sqrt{2}$ D) $\frac{x}{4} + \frac{y}{3} = \sqrt{2}$

21) Find the equation for the tangent plane to the surface $z = -6x^2 - 2y^2$ at the point $(2, 1, -26)$. 21) _______

A) $2x + y - 26z = -23$ B) $2x + y - 26z = 1$
C) $-24x - 4y - z = -26$ D) $-24x - 4y - z = -30$

22) Find parametric equations for the normal line to the surface $x^2 + 7xyz + y^2 = 9z^2$ at the point $(1, 1, 1)$. 22) _______

A) $x = t - 9,\ y = t - 9,\ z = t + 11$ B) $x = 9t + 1,\ y = -9t + 1,\ z = -11t + 1$
C) $x = t + 9,\ y = t + 9,\ z = t - 11$ D) $x = 9t + 1,\ y = 9t + 1,\ z = -11t + 1$

23) Write parametric equations for the tangent line to the curve of intersection of the surfaces $z = 2x^2 + 8y^2$ and $z = x + y + 8$ at the point $(1, 1, 10)$. 23) _______

A) $x = -15t + 1,\ y = 3t + 1,\ z = -12t + 10$ B) $x = -3t + 1,\ y = 5t + 1,\ z = -12t + 10$
C) $x = -3t + 1,\ y = 3t + 1,\ z = -12t + 10$ D) $x = -15t + 1,\ y = 5t + 1,\ z = -12t + 10$

Find the linearization of the function at the given point.

24) $f(x, y, z) = -8x^2 - 3y^2 + 8z^2$ at $(1, -2, 3)$ 24) _______

A) $L(x, y, z) = -16x + 12y + 48z - 52$ B) $L(x, y, z) = -16x - 12y + 48z + 52$
C) $L(x, y, z) = -16x + 12y + 48z + 52$ D) $L(x, y, z) = -16x - 12y + 48z - 52$

Find all local extreme values of the given function and identify each as a local maximum, local minimum, or saddle point.

25) $f(x, y) = x^2 + 18x + y^2 + 2y - 2$ 25) _______

A) $f(9, 1) = 244$, local maximum B) $f(-9, -1) = -84$, local minimum
C) $f(-9, 1) = -80$, saddle point D) $f(9, -1) = 240$, saddle point

26) $f(x, y) = (x^2 - 100)^2 + (y^2 - 64)^2$ 26) ________

A) $f(0, 0) = 14{,}096$, local maximum; $f(-10, -8) = 0$, local minimum

B) $f(0, 0) = 14{,}096$, local maximum; $f(0, 8) = 10{,}000$, saddle point; $f(0, -8) = 10{,}000$, saddle point; $f(10, 0) = 14{,}096$, saddle point; $f(10, 8) = 0$, local minimum; $f(10, -8) = 0$, local minimum; $f(-10, 0) = 4096$, saddle point; $f(-10, 8) = 0$, local minimum; $f(-10, -8) = 0$, local minimum

C) $f(0, 0) = 14{,}096$, local maximum; $f(10, 8) = 0$, local minimum; $f(10, -8) = 0$, local minimum; $f(-10, 8) = 0$, local minimum; $f(-10, -8) = 0$, local minimum

D) $f(0, 0) = 14{,}096$, local maximum; $f(0, 8) = 10{,}000$, saddle point; $f(10, 0) = 4096$, saddle point; $f(10, 8) = 0$, local minimum; $f(-10, -8) = 0$, local minimum

Find the absolute maxima and minima of the function on the given domain.

27) $f(x, y) = x^2 + xy + y^2$ on the square $-4 \le x, y \le 4$ 27) ________

A) Absolute maximum: 16 at $(4, -4)$ and $(-4, 4)$; absolute minimum: 12 at $(-2, 4)$, $(2, -4)$, $(4, -2)$, and $(-4, 2)$

B) Absolute maximum: 16 at $(4, -4)$ and $(-4, 4)$; absolute minimum: 0 at $(0, 0)$

C) Absolute maximum: 48 at $(4, 4)$ and $(-4, -4)$; absolute minimum: 16 at $(4, -4)$ and $(-4, 4)$

D) Absolute maximum: 48 at $(4, 4)$ and $(-4, -4)$; absolute minimum: 0 at $(0, 0)$

Find the extreme values of the function subject to the given constraint.

28) $f(x, y) = 8x^2 + 7y^2$, $x^2 + y^2 = 1$ 28) ________

A) Maximum: 7 at $(\pm 1, 0)$; minimum: 0 at $(0, 0)$

B) Maximum: 7 at $(0, \pm 1)$; minimum: 0 at $(0, 0)$

C) Maximum: 7 at $(\pm 1, 0)$; minimum: 8 at $(0, \pm 1)$

D) Maximum: 7 at $(0, \pm 1)$; minimum: 8 at $(\pm 1, 0)$

29) $f(x, y, z) = x + 2y - 2z$, $x^2 + y^2 + z^2 = 9$ 29) ________

A) Maximum: 9 at $(1, 2, -2)$; minimum: -9 at $(-1, -2, 2)$

B) Maximum: 1 at $(1, -2, -2)$; minimum: -1 at $(-1, 2, 2)$

C) Maximum: 8 at $(2, 1, -2)$; minimum: -8 at $(-2, -1, 2)$

D) Maximum: 1 at $(-1, -2, -3)$; minimum: -1 at $(1, 2, 3)$

Solve the problem.

30) Find the extreme values of $f(x, y, z) = x^2 + y^2 + z^2$ subject to $3x - y + z = 6$ and $x + 2y + 2z = 2$. 30) ________

A) Maximum: none; minimum: $\frac{148}{45}$ at $\left(\frac{74}{45}, -\frac{20}{45}, \frac{28}{45}\right)$

B) Maximum: none; minimum: $\frac{148}{45}$ at $\left(-\frac{74}{45}, \frac{20}{45}, \frac{28}{45}\right)$

C) Maximum: none; minimum: $\frac{148}{45}$ at $\left(\frac{74}{45}, -\frac{20}{45}, -\frac{28}{45}\right)$

D) Maximum: none; minimum: $\frac{148}{45}$ at $\left(\frac{74}{45}, \frac{20}{45}, -\frac{28}{45}\right)$

Answer Key
Testname: MATH 2013 PRACTICE QUIZ 2 FALL 2012

1) D
2) A
3) D
4) B
5) C
6) D
7) Answers will vary. One possibility is Path 1: $x = 0$, $y = t$; Path 2: $x = -t^2$, $y = t$
8) D
9) D
10) C
11) C
12) D
13) B
14) A
15) B
16) A
17) C
18) B
19) A
20) D
21) C
22) D
23) A
24) A
25) B
26) B
27) D
28) D
29) A
30) A