King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics

Math 201

Exam II

181

Wednesday 14/11/2018

Net Time Allowed: 120 minutes

MASTER VERSION

1. At which point does the line with parametric equations

$$x = -1 + 3t \quad y = 2 - 2t \quad z = 3 + t$$

intersect the plane $3x + y - 4z = -4$?

(a) $(8, -4, 6)$

(b) $(0, 0, 1)$

(c) $(1, 1, 2)$

(d) $\left(2, 4, \frac{7}{2}\right)$

(e) they do not intersect

2. Symmetric equations for the line through the point $(1, -2, -4)$ that is orthogonal to the plane $2x - y + 3z = 5$ are given by

(a) $\dfrac{x-1}{2} = \dfrac{y+2}{-1} = \dfrac{z+4}{3}$

(b) $\dfrac{x+1}{2} = \dfrac{y-2}{-1} = \dfrac{z-4}{3}$

(c) $\dfrac{x-1}{2} = \dfrac{-y-2}{-1} = \dfrac{z+4}{3}$

(d) $\dfrac{x-1}{\sqrt{14}} = \dfrac{y+2}{\sqrt{14}} = \dfrac{z+4}{\sqrt{14}}$

(e) $\dfrac{x+1}{\sqrt{14}} = \dfrac{y-2}{\sqrt{14}} = \dfrac{z-4}{\sqrt{14}}$

3. Which of the following functions has level curves drawn below?

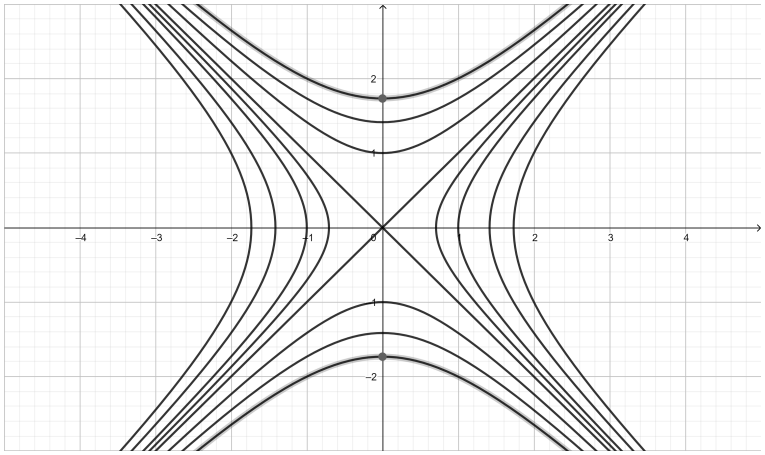
(a) $f(x,y) = x^2 - y^2$

(b) $f(x,y) = x^2 + y^2$

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

(d) $f(x,y) = x + y^2$

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



4. The distance between the planes

$$2x - 3y + z = 4, \quad 4x - 6y + 2z = 3$$

(a) $\dfrac{5}{2\sqrt{14}}$

(b) $\dfrac{1}{\sqrt{14}}$

(c) $2\sqrt{14}$

(d) 1

(e) 14

5. A point on the surface $z = x^2 - y^2$ where the tangent plane is parallel to the plane $x + 3y + z = 2018$ is

(a) $\left(-\frac{1}{2}, \frac{3}{2}, -2\right)$

(b) $(0, 0, 0)$

(c) $(-1, 1, 0)$

(d) $\left(\frac{1}{2}, -\frac{3}{2}, -2\right)$

(e) $\left(-\frac{1}{2}, -\frac{3}{2}, -2\right)$

6. The directional derivative of $f(x, y) = xe^{2y}$ at the point $(1, 0)$ in the direction of $< -1, 2 >$ is

(a) $\frac{3}{\sqrt{5}}$

(b) 3

(c) $\frac{1}{\sqrt{5}}$

(d) 1

(e) $\sqrt{5}$

7. An equation of the tangent plane to the surface $xz + \ln(2x + y) = 5$ at the point $(-1, 3, -5)$ is

(a) $-3x + y - z = 11$

(b) $3x + y + z = -5$

(c) $3x + y - z = 5$

(d) $-x + 3y - 5z = 35$

(e) $z = \ln(2x + y) - 5$

8. If $x^2 + y^2 + z^2 = 3xyz$, then $\dfrac{\partial z}{\partial x}(1, 1, 1) + \dfrac{\partial z}{\partial y}(1, 1, 1) =$

(a) -2

(b) 0

(c) 2

(d) -1

(e) 1

9. Which of the following vectors is parallel to the plane $3x - 5y + 7z = 10$?

(a) $\langle 1, 2, 1 \rangle$

(b) $\langle 1, -2, 1 \rangle$

(c) $\langle 1, 3, 1 \rangle$

(d) $\langle 1, 0, 1 \rangle$

(e) $\langle 3, -5, 7 \rangle$

10. Find the limit

$$\lim_{(x,y)\to(0,0)} \frac{2x^4y^2}{x^4 + 3y^4}$$

(a) 0

(b) 2

(c) 2/3

(d) 1/2

(e) does not exist

11. If

$$f(x,y) = e^{\sin x} + x^5\, y + \ln(1+y^2),$$

then $\dfrac{\partial^2 f}{\partial x\, \partial y}$

(a) $5x^4$

(b) $\dfrac{2y}{1+y^2}$

(c) $20x^3\, y$

(d) $e^{\sin x}\, \cos x$

(e) $e^{\sin x}\, \cos x + x^5 + \dfrac{2y}{1+y^2}$

12. What is the direction in which the function

$$f(x,y) = yx^2 - \frac{x}{y^2}$$

increases most rapidly at the point $(-2,1)$?

(a) $\langle -1, 0\rangle$

(b) $\left\langle \dfrac{1}{\sqrt{2}}, \dfrac{1}{\sqrt{2}} \right\rangle$

(c) $\langle 0, 1\rangle$

(d) $\langle -2, 2\rangle$

(e) $\langle 2, -2\rangle$

13. Consider the surface

$$x^2 - 3y^2 - 9z^2 = 0.$$

Which of the following is/are correct?

(A) The traces in the plane parallel to the yz-plane are ellipses.
(B) The vertical trace in the xz-plane is the lines $x = 3z$ and $x = -3z$.
(C) The surface is a hyperboloid of two sheets.

(a) (A) and (B) only

(b) (A) only

(c) (B) and (C) only

(d) (B) only

(e) (C) only

14. Find the limit

$$\lim_{(x,y)\to(0,0)} \frac{4x^2y^2 - x^2 - y^2}{x^2 + y^2}$$

(a) -1

(b) 1

(c) 0

(d) 3

(e) does not exist

15. The x-coordinate of the point of intersection of the plane $x + 2y + z = 6$ and the line through the points $(1, 0, 1)$ and $(2, -1, 1)$ is

(a) -3

(b) -2

(c) -1

(d) 0

(e) 1

16. Describe the level surfaces of the function

$$f(x, y, z) = x^2 + y^2 + z^2 - 2x - 4y + 8z - 201$$

(a) spheres with center $(1, 2, -4)$

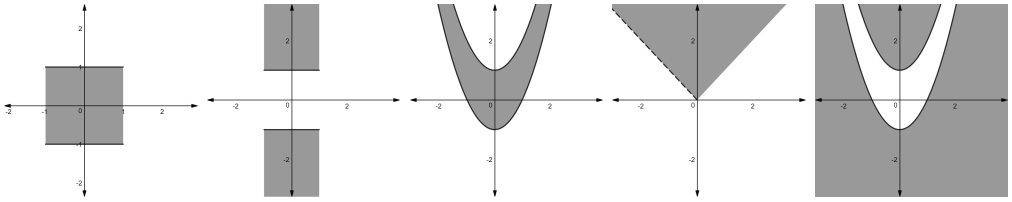
(b) spheres with center $(-2, 4, 8)$

(c) spheres with center $(0, 0, 0)$

(d) planes with normal $\langle -2, -4, 8 \rangle$

(e) planes with normal $\langle 1, 1, 1 \rangle$

17. Match the function expressions
A. $f(x,y) = \arcsin(y - x^2)$
B. $f(x,y) = \sqrt{1-x^2} - \sqrt{1-y^2}$
C. $f(x,y) = \sqrt{y-x}\,\ln(y+x)$
with their domains among the sketched regions.



(a) (b) (c) (d) (e)

(a) $A \to c$, $B \to a$, $C \to d$

(b) $A \to c$, $B \to a$, $C \to b$

(c) $A \to c$, $B \to b$, $C \to d$

(d) $A \to e$, $B \to c$, $C \to a$

(e) $A \to e$, $B \to d$, $C \to c$

18. Using the method of linear approximation to the function $f(x,y) = \dfrac{x}{x+2y}$ at $(1,2)$, the approximate value of $f(1.5, 2.5)$ is

(a) $\dfrac{6}{25}$

(b) $\dfrac{4}{25}$

(c) $\dfrac{7}{25}$

(d) $\dfrac{6}{5}$

(e) $\dfrac{4}{5}$

19. If $z = x^2 + xy^3$, $x = uv^2 + w^2$, and $y = u + ve^w$, what is $\dfrac{\partial z}{\partial u}$ when $u = 2$, $v = 1$ and $w = 0$?

(a) 85

(b) 93

(c) 42

(d) 66

(e) 99

20. At what point is the tangent plane to the graph of the function

$$f(x, y) = x^2 + y^2 + xy - x + 4y$$

horizontal

(a) $(2, -3,\ f(2, -3))$

(b) $(2, 3, f(2, 3))$

(c) $(1, 5, f(1, 5))$

(d) $(-1, 5, f(-1, 5))$

(e) $(-1, -4,\ f(-1, -4))$

Q	MM	V1	V2	V3	V4
1	a	a	e	d	c
2	a	e	b	d	b
3	a	e	d	d	b
4	a	d	d	b	d
5	a	e	b	d	d
6	a	c	e	c	c
7	a	e	d	b	a
8	a	b	b	c	b
9	a	d	c	c	a
10	a	e	e	a	e
11	a	b	c	a	b
12	a	a	e	a	d
13	a	a	d	a	a
14	a	a	e	a	e
15	a	b	c	d	b
16	a	c	e	e	a
17	a	c	c	a	d
18	a	e	c	d	c
19	a	a	d	d	c
20	a	b	d	b	d