BIRZEIT UNIVERSITY

Mathematics Department

Math 231 **First Hour Exam** **Fall /2022**

Students name:..... KEY **Students number:.....**

Q#1 80% circle the correct answer.

1- If $u = 4j + 3k, \upsilon = 7i - 3j + k$ then proj $_{\upsilon} u$

a. $\frac{21}{5}i - \frac{9}{5}j + \frac{3}{5}k$

b. $\frac{12}{5}j + \frac{9}{5}k$

(c.) $\frac{-63}{59}i + \frac{27}{59}j - \frac{9}{59}k$

d. $\frac{60}{59}j - \frac{45}{59}k$

Q#2- The volume of the box determined by $u = i + j + k$, $\upsilon = 2i - j + k$ $w = 3i - 2j + 5k$ **is**

a. 5

b. 6

c. 10

(d.) 11

Q#3- The equation of the line through the point (2,1,3) and perpendicular to the vectors $u = 2i - j + k$ and $\upsilon = 3i - 2j + 5k$ is

a. $x = 2 - 3t, y = -1 + 7t, z = 3 - t$, $-\infty < t < \infty$

(b) $x = 2 - 3t, y = 1 - 7t, z = 3 - t$, $-\infty < t < \infty$

c. $x = -2 + 3t, y = -1 + 7t, z = 3 - t$, $-\infty < t < \infty$

d. $x = 2 + 3t, y = -1 - 7t, z = 3 - t$, $-\infty < t < \infty$

Q#4 The set of points in space with coordinates satisfies

$x^2 + y^2 + z^2 = 25$, $y = 4$ is

(a.) The circle $x^2 + z^2 = 9$ in the plane y=4

b. $\{(0,4,3), (0,4,-3), (-3,4,0)\}$

c. A set of 8 points

d. The circle $x^2 + y2 = 25$ in the plane $y = 4$

Q#5 The equation of the plane through $(3,-1,2)$ perpendicular to the $x-$axis is

a. $x + y + z = 4$

b. $z = 2$

c. $y = -1$

(d.) $x = 3$

Q#6 The angle between the diagonal of a cube and the diagonal of one of its faces is

a. $\Pi / 3$

b. $\Pi / 4$

(c.) $\cos^{-1}\left(\frac{2}{\sqrt{6}}\right)$

d. $\cos^{-1}(1/3)$

Q#7 The area of the triangle with vertices A (1,1,1), B (2,1,3) and C(3,-1,1) is

(a) 3 b) 4

c) 5 d) 6

Q#8 One of the following is not always true

(a) $\vec{u} \times \vec{v} = \vec{v} \times \vec{u}$

b. $\vec{u} \times (\vec{v}+\vec{w}) = (\vec{u} \times \vec{v}) + (\vec{u} \times \vec{w})$

c. $\vec{i} \times \vec{j} = \vec{k}$

d. $\vec{i} \cdot \vec{j} = 0$

Q#9 The distance from the point (2,1,3) to the line $x = 2+2t, y = 1+6t, z = 3$ **is**

a. 3

b. 4

c. 5

(d) 0

Q#10 The distance from the point (2, -3,4) to the plane $x + 2y + 2z = 13$ **is**

(a) 3

b. 4

c. 5

d. 6

Q#11 The angle between the plane $x + y = 1$ and the plane $2x + y - 2z = 2$ **is**

a. $\Pi / 6$

b. $\Pi / 3$

(c) $\Pi / 4$

d. $\Pi / 2$

Q#12 The line $x = -1+3t, y = -2, z = 5t$ meets the plane $2x - 3z = 7$ at

a. (4,2,5)

b. (2, -2, -5)

(c) (-4, -2, -5)

d. (1,0, -5)

Q#13 The equation of the line of intersection of the two planes $3x - 6y - 2z = 3$ and $2x + y - 2z = 2$ is

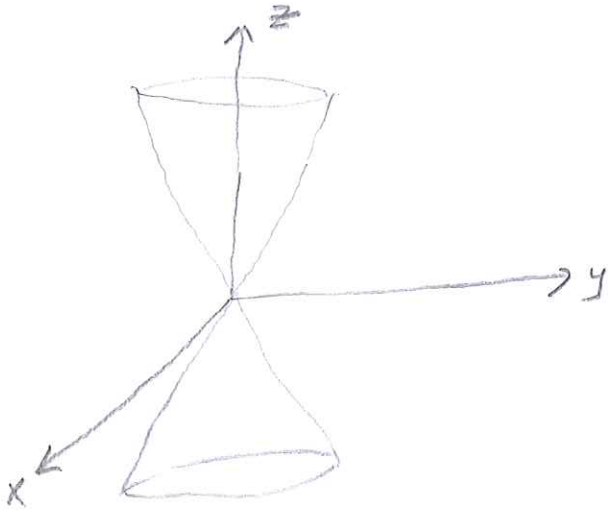
a. $x = 1 + 4t, y = 2 + 2t, z = 15t$

b. $x = 14t, y = 2z, z = 15t$

(c) $x = 1 + 14t, y = 2t, z = 15t$

d. $x - 14t, y = 2 - z, 2+, z = 15t$

Q#14 The equation of the surface is



a. $x^2 + y^2 + z^2 = 4$

b. $x^2 - y^2 = z^2$

(c) $x^2 + y^2 = z^2$

d. $x^2 + z^2 = y^2$

Q#15 The length of the curve

$x = (2\cos t)i + (2\sin t)j + (\sqrt{5}t)k \ , 0 \le t \le \frac{\pi}{2}$ **is**

a. $\frac{\pi}{2}$ b) 2π

(c) $\frac{3}{2}\pi$ d) π

Q#16 The unit tangent vector of the space curve $r = (3\sin t)i + (3\cos t)j + (4t)k$ is

a. $\frac{1}{5}(3\cos ti + 3\sin tj + 4k)$ b. $-\frac{1}{5}(3\cos ti + 3\sin tj - 4k)$

(c) $1/5(3\cos ti - 3\sin tj + 4k)$ d. $-1/5(3\cos ti - 3\sin tj + 4k)$

Questio#2 (12%) Find

a) $Lim_{(x,y)\to(1,1)} \dfrac{xy-y-2x+2}{x-1}$, $x \neq 1$

$$\lim_{(x,y)\to(1,1)} \frac{xy-y-2x+2}{x-1} = \lim_{(x,y)\to(1,1)} \frac{x(y-2)-(y-2)}{x-1}$$

$$= \lim_{(x,y)\to(1,1)} \frac{(y-2)(x-1)}{(x-1)}$$

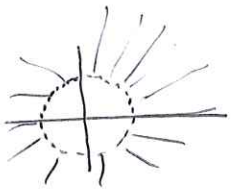
$$= \lim_{(x,y)\to(1,1)} y-2 = -1.$$

b) $Lim_{(x,y)\to(0,0)} \dfrac{y^2}{x^2+y^2}$

$$\lim_{\substack{(x,y)\to(0,0)\\ y=kx}} \frac{y^2}{x^2+y^2} = \lim_{\substack{(x,y)\to(0,0)\\ y=kx}} \frac{k^2x^2}{x^2+k^2x^2} = \lim_{\substack{(x,y)\to(0,0)\\ y=kx}} \frac{x^2(k^2)}{x^2(k^2+1)} = \frac{k^2}{k^2+1}$$

So Limit does not exists

Questio#3 (12%) Let $f(x,y) = \ln(x^2+y^2-4)$. Find



a) The domain of f $x^2+y^2-4>0 \Rightarrow x^2+y^2>4$

b) The boundary of the domain $x^2+y^2=4$

c) The range of f $(-\infty, \infty)$

d) Describe The function level curves and sketch one of them

circles $\ln(x^2+y^2-4) = c$,

$x^2+y^2 = 4+e^c$, $c>0$.