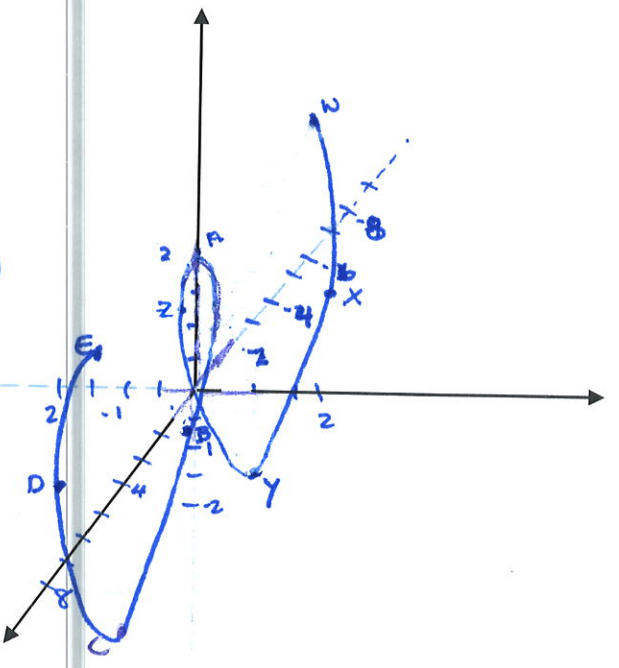
MAT 201, Quiz #2, Spring 2016 Name KEY

Instructions: Show all work. Answers without work required to obtain the solution will not receive full credit. Some questions may contain multiple parts: be sure to answer all of them. Give exact answers unless specifically asked to estimate.

t	x	y	z	
0	0	0	2	A
π/2	1.6	1	0	B
π	3.1	0	-2	C
3π/2	4.7	-1	0	D
2π	6.3	0	2	E
-π/2	-1.6	-1	0	Z
-π	-3.1	0	-2	Y
-3π/2	-4.7	1	0	X
-2π	-6.3	0	2	W

A → X → Y → Z → A → B → C → D → E

1. Sketch the graph of the helix $\vec{r}(t) = t\hat{\imath} + \sin t\,\hat{\jmath} + 2\cos t\,\hat{k}$. Be sure to label the axes.



2. Find the determinant of $A = \begin{bmatrix} 3 & -2 & 1 \\ 1 & 1 & 0 \\ 4 & 2 & -1 \end{bmatrix}$

$3(-1-0) - (-2)(-1-0) + 1(2-4)$
$= -3 + (-2) + (-2) =$
-7

3. Find $\langle 6,0,-2\rangle \times \langle 2,4,6\rangle$

$$\begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 6 & 0 & -2 \\ 2 & 4 & 6 \end{vmatrix} = (0+8)\hat{\imath} - (36+4)\hat{\jmath} + (24-0)\hat{k}$$
$$8\hat{\imath} - 40\hat{\jmath} + 24\hat{k}$$

4. Use the information found in #3 to find an equation of the line through the point $(2,-1,7)$ pointing in that direction.

$\hat{\imath} - 5\hat{\jmath} + 3\hat{k}$ (scaled by 8) $= \langle a,b,c\rangle$

$\vec{r}(t) = (t+2)\hat{\imath} + (-5t-1)\hat{\jmath} + (3t+7)\hat{k}$ vector form

or $\dfrac{x-2}{1} = \dfrac{y+1}{-5} = \dfrac{z-7}{3}$ symmetric form

parametric
$x = t+2$
$y = -5t-1$
$z = 3t+7$

5. The points $(-1,3,1), (0,5,2), (4,3-1)$ form a plane. Find a vector orthogonal to the plane. Use that vector to find an equation of the plane containing these three points.

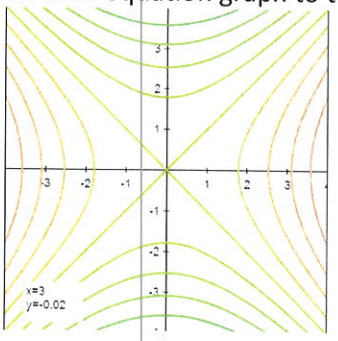
$\langle -1,-2,-1\rangle$ or $\langle 1,2,1\rangle$
$\langle -4,2,3\rangle$

$$\begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 1 & 2 & 1 \\ -4 & 2 & 3 \end{vmatrix} = (6-2)\hat{\imath} - (3+4)\hat{\jmath} + (2+8)\hat{k} = 4\hat{\imath} - 7\hat{\jmath} + 10\hat{k} \quad \text{or } \langle 4,-7,10\rangle$$

$4(x+1) + (-7)(y-3) + 10(z-1) = 0$
$4x + 4 - 7y + 21 + 10z - 10 = 0$
$4x - 7y + 10z = -15$

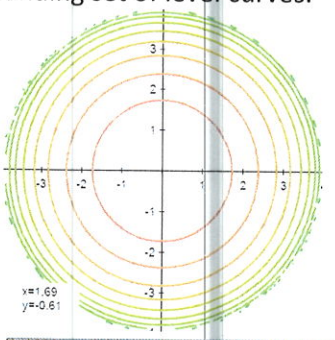
6. Match each equation graph to the corresponding set of level curves.

ii



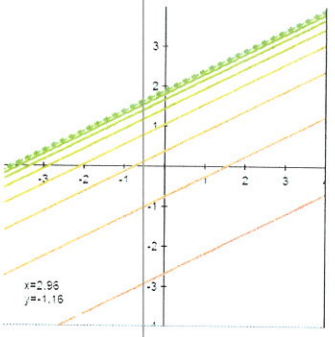
a.

iii



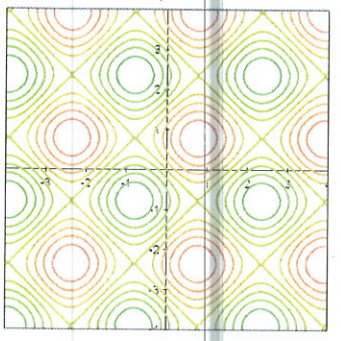
c.

iv



b.

i



d.

i. $z = \sin(x + y)\cos(x - y)$ d

ii. $z = x^2 - y^2$ a

iii. $z = \sqrt{16 - x^2 - y^2}$ c

iv. $z = \ln(x - 2y + 4)$ b

Note: On these graphs, greener shades are smaller values of z, while redder shades are larger values.