Math 126, Section C, Autumn 2012, Midterm I

October 18, 2012

Name____

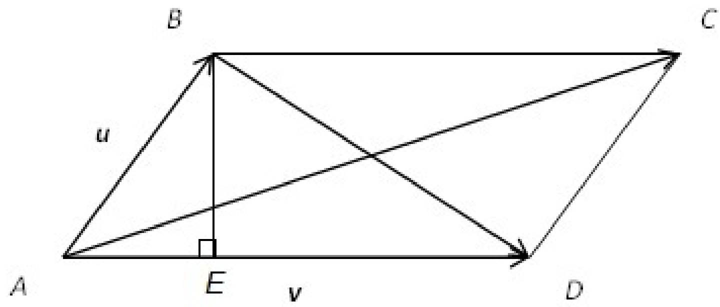
TA/Section____

Instructions.

- There are 4 questions. The exam is out of 40 points.
- You are allowed to use one page of notes written only on one side of the sheet in your own handwriting. **Hand in your notes with your exam paper.**
- You may use a calculator which does not graph and which is not programmable. Even if you have a calculator, give me exact answers. ($\frac{2\ln 3}{\pi}$ is exact, 0.7 is an approximation for the same number.)
- **Show your work**. If I cannot read or follow your work, I cannot grade it. You may not get full credit for a right answer if your answer is not justified by your work. If you continue at the back of a page, make a note for me. Please $\boxed{\text{BOX}}$ your final answer.

Question	points
1	
2	
3	
4	
Total	

1. Answer the following question regarding the picture below



We know $\vec{AC} = \langle 2, 6, 2\rangle$, $\vec{BD} = \langle 4, 0, -2\rangle$ and $A = (0, 2, -1)$.

(a) (4 points) Compute the two vectors $\mathbf{u}= \vec{AB} = \vec{DC}$ and $\mathbf{v}= \vec{AD} = \vec{BC}$.

(b) (3 points) Find the coordinates of the points B and C.

(c) (3 points) The line containing B and E is perpendicular to the line containing A to D as shown in the picture. Find the coordinates of the point E.

2. Given two planes

$$P1: \qquad 2x - y + z = 5$$

and

$$P2: \qquad 3x + 2y - z = 3,$$

(a) (6 points) Find parametric equations for the line of intersection of the two planes. Check that your line is indeed on both planes.

(b) (3 points) Find the equation of a third plane $P3$ which contains that line and the point $P(0, 7, 2)$.

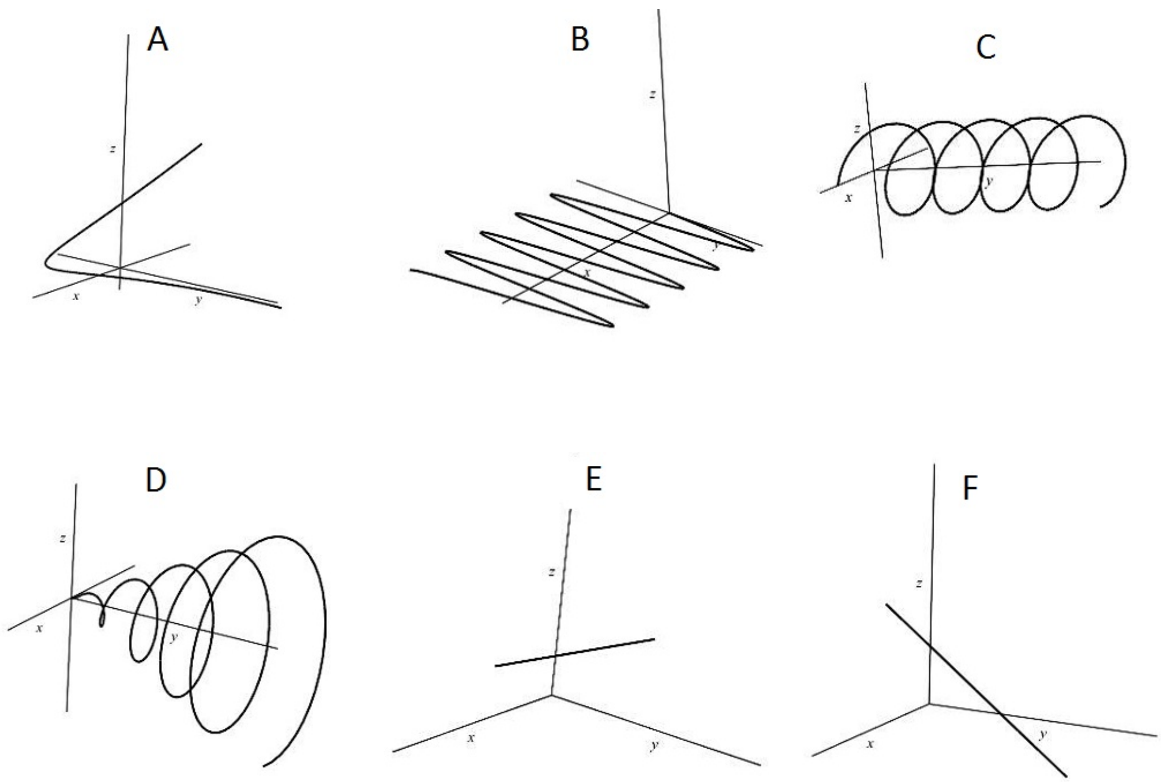
(c) (1 point) Find the line of intersection of the planes $P1$ and $P3$.

3. Answer the following.

(a) (6 points) Match the following vector functions with the curves they trace in space. The positive z-axis points up in the graphs. Write the letter of the graph next to the corresponding vector function.

$\mathbf{r_1}(t) = \langle t+3, 2t-1, -t+4 \rangle$ ________ $\mathbf{r_2}(t) = \langle 2t+3, 2t-1, t+4 \rangle$ ________ $\mathbf{r_3}(t) = \left\langle t\cos(t), t, \frac{t\sin(t)}{2} \right\rangle$ ______

$\mathbf{r_4}(t) = \langle t, \sin(t), 0 \rangle$ ________ $\mathbf{r_5}(t) = \left\langle t+1, 2t^2-5t+1, t^3 \right\rangle$ ________ $\mathbf{r_6}(t) = \left\langle \cos(t), 10t, \frac{\sin(t)}{2} \right\rangle$ ______



(b) (4 points) Find the vector equation of the tangent line to $\mathbf{r}(t) = \left\langle t+1, 2t^2-5t+1, t^3 \right\rangle$ at the point where $t = 2$.

4. Given the equation

$$x^2 - 4y^2 + 4z^2 + 8y = 4,$$

(a) (5 points) Identify the surface and sketch it. Label your axes so I can see the orientation. Label any points you think are important, for example, if you have a sphere, label its center.

(b) (4 points) Find the point(s) of intersection of the above surface and the line given by

$$x = 8t \qquad y = 5t + 1 \qquad z = 3 - t.$$

(c) (1 point) Write one vector function which gives a curve on this cone. There are many answers to this question.