Math 213 Calculus III

Spring 2014

Reading the Text

Read Sections 9.5-9.6 and answer the following questions

1. When specifying the equation of a line in space, the text says that you need a point on the line and a vector parallel to the line. Why can't you determine a line in space simply by using one vector?

2. Find symmetric equations of the line going through the points (1,2,1) and (-1,3,5).

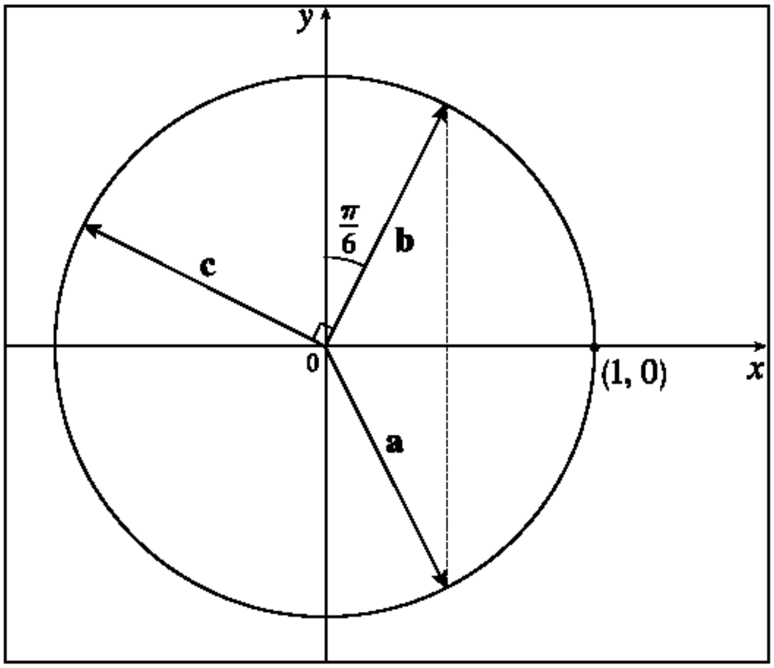
3. If *f* is a function of two variables and $f(3,4) = -1$, give the coordinates of a point on the graph of *f*.

4. What are the vertical traces of the surface $z = 4x^2 + y^2$? What are the horizontal traces for $z > 0$? For $z < 0$?

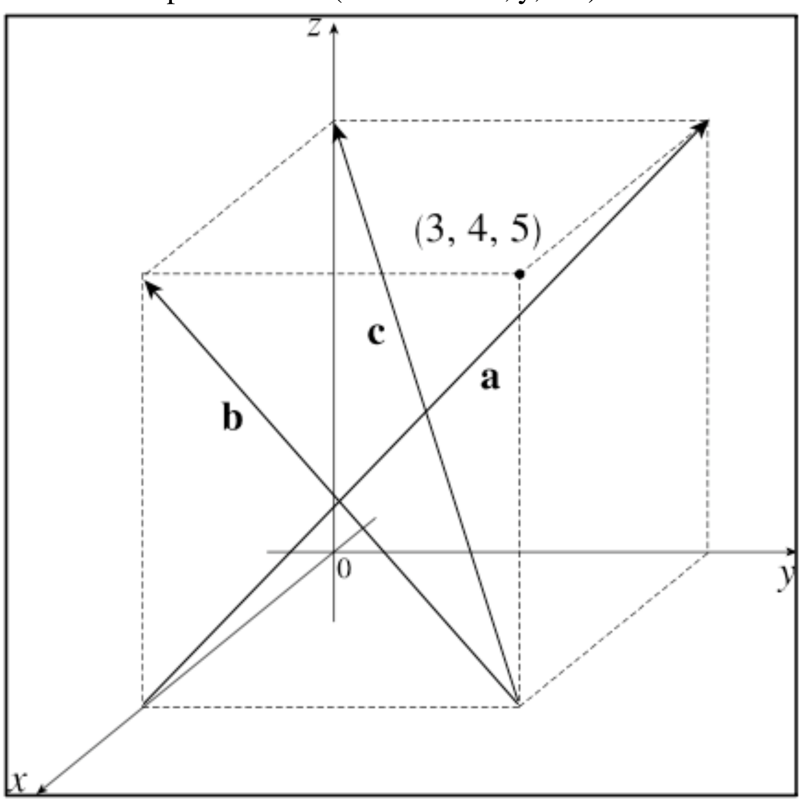
5. Why is the quadric surface $x^2 + \frac{1}{9}y^2 + \frac{1}{4}z^2 = 1$ not the graph of a function $f(x,y)$?

Math 213 Class 02: Component Vectors

Find the component form (the form <x,y>) of the vectors **a**, **b**, **c** shown in the diagram below

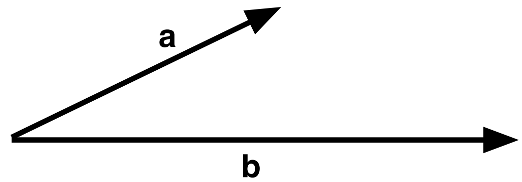


Now for a 3D problem.
Find the component form (the form < x, y, z >) of the vectors **a**, **b**, **c** shown in the diagram below



Math 213 Class 02: Dot and Cross Product

1. Consider the following two vectors. Draw the vector projection of **b** onto **a** and the vector projection of **a** onto **b**.



2. If $\mathbf{a} \neq \mathbf{0}$ and $\mathbf{a} \cdot \mathbf{b} = \mathbf{a} \cdot \mathbf{c}$ then is $\mathbf{b} = \mathbf{c}$? Explain or give a counterexample.

3. If $\mathbf{a} \neq \mathbf{0}$ and $\mathbf{a} \times \mathbf{b} = \mathbf{a} \times \mathbf{c}$ then is $\mathbf{b} = \mathbf{c}$?

4. If $\mathbf{a} \perp \mathbf{b}$ then what is the length of $\mathbf{a} \times \mathbf{b}$?

Math 213 Class 02: Triangles: The Right Stuff

For each problem below, the set of points given form a triangle. Is the triangle a right triangle? Justify your answer.

1. (-2,-1),(-2,8),(8,-1)

2. (0,0),(10,7), (-14,20)

3. (3,4),(3,12),(6,5)

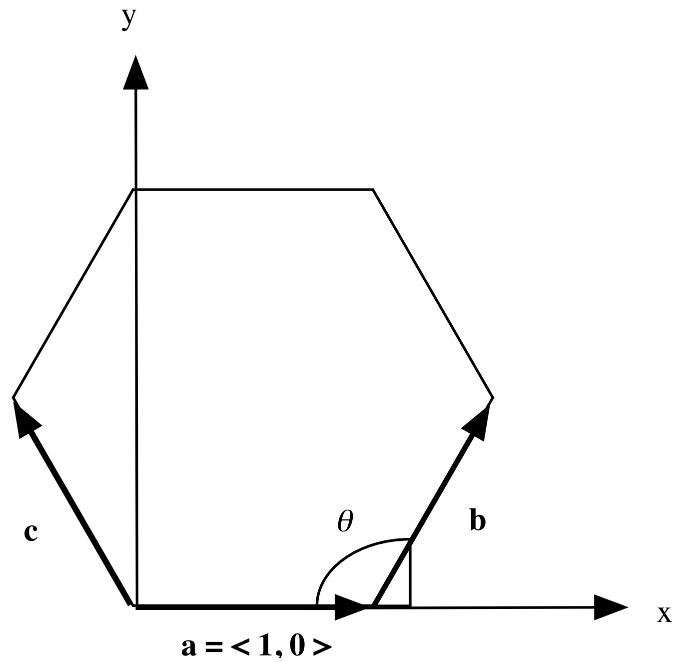
4. (2,1,2),(3,3,1),(2,2,4)

5. (-1,-2,-3),(0,0,-4),(-1,-1,-1)

6. (2,3,6),(3,4,7),(3,3,6)

Math 213 Class 02: The Regular Hexagon

Consider the following regular hexagon, with **a**=<1,0>



1.Compute $|\,\mathbf{a}\,|, |\,\mathbf{b}\,|, |\,\mathbf{c}\,|$.

2.What is the angle θ?

3.What is $\mathbf{a} \cdot \mathbf{b}$?

4.What is $\mathbf{a} \cdot \mathbf{c}$?

5.What are $\text{proj}_{\mathbf{a}}\mathbf{b}$ and $\text{proj}_{\mathbf{b}}\mathbf{c}$?

6.What is the x component of $\mathbf{a} + \mathbf{b} + \mathbf{c}$?

Math 213 Class 02: Lines in the Plane

Let t be a scalar.

Let the vector $\mathbf{r}(t) = \langle 4,3\rangle + t\langle 2,-1\rangle$ be a function of t. Suppose the initial point of $\mathbf{r}(t)$ is always the origin.

Compute and give the vectors $\mathbf{r}(t)$ for t = 0,1,2,3,-1,and -1.5.

Into the coordinate system draw the vector $\mathbf{r}(t)$ for t = 0,1,2,3,-1,and -1.5.