

**Mathematics 135H – (Non?-)Linear algebra I: matrix algebra**  
TRENT UNIVERSITY, Fall 2007

**Assignment #2**

Due on Friday, 5 October, 2007.

In two dimensions the equation of a circle of radius  $r$  centred at  $(a, b)$  is:

$$(x - a)^2 + (y - b)^2 = r^2$$

1. Using algebra – including linear algebra! – find the radius and centre of the circle passing through the points  $(2, 5)$ ,  $(0, 1)$ , and  $(3, 4)$ . [6]
2. Explain why, in general, three points in two-dimensional space (not all in a straight line) suffice to specify a circle passing through all three. [2]
3. How many points does one need, in general, to specify a sphere in three-dimensional space? What restriction(s) must these points satisfy? [2]

**Bonus.** Show that there must be irrational numbers  $a$  and  $b$  such that  $a^b$  is rational. [1]

**Maternity**

There once was a Square, such a square little Square,  
And he loved a trim Triangle;  
But she was a flirt and around her skirt  
Vainly she made him dangle.  
Oh he wanted to wed and he had no dread  
Of domestic woes and wrangles;  
For he thought that his fate was to procreate  
Cute little Squares and Triangles.  
Now it happened one day on that geometric way  
There swaggered a big bold Cube,  
With haughty stare and he made that Square  
Have the air of a perfect boob;  
To his solid spell the Triangle fell,  
And she thrilled with love's sweet sickness,  
For she took delight in his breadth and height—  
But how she adored his thickness!  
So that poor little Square just died of despair,  
For his love he could not strangle;  
While the bold Cube led to the bridal bed  
That cute and acute Triangle.  
The square's sad lot she has long forgot,  
And his passionate pretensions . . .  
For she dotes on her kids— Oh such cute *Pyramids*  
In a world of three dimensions.

*Robert Service*