Homework 2

This homework is due in class on Monday 10/12/09

1 Course material [75]

1.1 Rectangular coordinates

Textbook Questions: Section 1.4: 4, 8, 18, 20

1.2 Graphs

Textbook Questions: Section 1.5: 4, 6, 8, 10, 18, 22, 40

1.3 Equations of lines

Textbook Questions: Section 1.6: 2(a), 4, 9, 10, 12, 18, 20, 21, 22, 26 (graph not required), 32, 34, 36

1.4 Quadratic equations

Textbook Questions: Section 2.1: 6, 8, 14, 36, 42, 48

1.5 Other types of equations

Textbook Questions: Section 2.2: 2, 10, 20, 22, 30, 50, 60, 62 (see Section 2.2, pages 99 and 100 on how to do the last 2 problems).

2 Applied Problem [25]

This problem will help you find out why most cylindrical tin-cans have the same aspect ratio. As in the previous homework, a fraction of the points will be awarded for a good presentation and a good discussion of your results.

Question 1: What is the equation which relates the volume V of a cylindrical tin-can with its height h and its radius r? Hint: see cover of textbook.

Question 2: What is the equation which relates the surface area S of a cylindrical tin-can with its height and radius? Hint: there are three components to the surface: the top, the bottom and the side.

Question 3: If you want to construct a tin-can of a *given volume* V, what is the equation which relates its height to its radius? If you are stuck with too many variables, consider for example a typical 16 ounce can of beans. However, because we have to be metric, that's 500 ml or in other words 500cm^3.

Question 4: For the same "500 cm^3 can", what is the equation which relates the surface area S to its radius? Hint: you need to use the result from the previous question...

Question 5: Graph this equation on graphing paper, for r between 0 and 10 cm. What do you notice? How do you explain this in 'non-mathematical' terms?

Question 6: Given that the cost of producing a tin-can mostly comes from the metal which is needed to make it, can you now explain why roughly all 16-ounce tin-cans look the same?

Question 7: According to your theory, what is the radius of a typical 16-ounce tin-can? What is its height?

Question 8: (optional) compare it with a real tin-can. Does that fit your theory (roughly?)? (Note: be careful of your inches and cms - with a volume calculated in cm^3 you get a radius and a height in cm, not in inches).