PHYS 495 Problem Set 2

Date: Thursday, November 13^{th}, 2003
Due date: Thursday, November 20^{th}, 2003

Instructions: Work should be submitted on or before due date. Submit your work to the teaching assistant both in electronic and printed forms.

- **Problem 1** - [30 points]

Write a `Line` class which represents a line in two dimensions. The most general form of a line in two dimensions is:

$$a \cdot x + b \cdot y = c$$

Therefore, it should have `a`, `b`, and `c` as `double` member variables. It should have two constructors; one that takes three arguments (`a`, `b`, and `c`). The other constructor should take two argumens, `m` and `k` as in:

$$y = m \cdot x + k$$

That constructor should calculate what `a`, `b`, and `c` should be to represent that line, and set them accordingly.[1]

- **Problem 2** - [30 points]

Add a `distanceTo()` method to the `Line` class. It should take a `Point` object as an argument (the one we did in class) and return the distance of the point to the line as a `double`.[2]

- **Problem 3** - [40 points]

Add an `intersection()` method to the `Line` class. It should take another `Line` object as an argument, and return the point of intersection of the two lines as a `Point` object.[3]

Test Suite

```
public class TestLine {
    public static void main(String[] args) {
        // 2x - y = -2
        Line line1 = new Line(2.0, -1.0, -2.0);
        // y = -3x + 12
        Line line2 = new Line(-3.0, 12.0);
        Point p = new Point(0.0, 0.0);

        System.out.println("Distance: " + line1.distanceTo(p));

        Point q = line1.intersection(line2);
        System.out.println("Intersection: " + q.getX() + "," + q.getY());

    }
}
```

[1] I hope none of you need help to find `a`, `b`, and `c` from `m` and `k`. If you do, let me know.
[2] Look the formula up in your mathematics textbooks, if you need to.
[3] Don't worry about the case when the lines are parallel.