/* Name:       Neal R. Wagner, Course Instructor
Date:       Due Feb 14, 1997
Course:     CS 1713 Section 02
Subject:    Print the equation of a line through
two points on the graph of an equation.
Algorithm:  Read x-coordinates x1 and x2.
Calculate the corresponding y-coords y1 and y2.
Calculate the slope m and the y-intercept b.
Use m and b to print the line's equation.

Input:      Keep reading pairs of x-coords up to zeros.
Output:     Unless the x-coords are the same, print the
line in as in a calculus book.

*/

#include <stdio.h>
#include <math.h>
double f(double x);
void printnum(double z);
void printline(double x1, double y1, double x2, double y2);

void main(void)
{
  double x1, y1, x2, y2; /* coords of two points */
  printf("Lines through x^2 - 3x - 2.
");
  for (;;) {
    scanf("%lf %lf", &x1, &x2);
    if (x1 == 0.0 && x2 == 0.0) break;
    y1 = f(x1); y2 = f(x2);
    printline(x1, y1, x2, y2);
    printf("\n\n");
  }
  printf("Other lines:
");
  printline(2.0, 3.0, 2.0, 4.0); printf("\n");
  printline(1.0, 0.0, 3.0, 0.0); printf("\n");
  
  /* f: function on which the points occur. */
  double f(double x)
  {
    return x*x - 3.0*x -2;
  }
  /* print num: Print a double with two decimals unless */
  /* it is an exact integer,*/
  void printnum(double z)
  {
    if ( ((int) z) == z)
      printf("%1.0f", z);
    else
      printf("%3.2f", z);
  }
  /* printline: Print a line as in a calculus book. */
  /* x1 and x2 are input x-coordinates of two points, */
  /* with y1 and y2 the corresponding y-coordinates.  */
  void printline(double x1, double y1, double x2, double y2)
  {
    double m, b;
    printf("Line through points: ");
    printf("%3.2f,%3.2f),(%3.2f,%3.2f)
", x1, y1, x2, y2);
    if (x1 == x2) {
      if (y1 == y2)
        printf("Identical points.  There is no line.");
      else {
        printf("Equation of line: X = ");
        printnum(x1);
      }
    return;
    }
    m = (y1 - y2)/(x1 - x2); b = -m*x1 + y1;
    printf("Equation of line: Y = ");
    /* handle case of no X term here, i.e., m == 0.0. */
    /* This includes the case m == 0  && b == 0. */
    if (m == 0.0) {
      printnum(b);
      return;
    }
    /* Print the X term, assuming m != 0. */
    if (m == 1.0)
      printf("X ");
    else if (m == -1.0)
      printf("-X ");
    else {
      printnum(m); printf("X ");
    }
    /* Print constant term.  Note: if b == 0, print  */
    /*   nothing (works because m != 0 here).  */
    if (b < 0.0) {
      printf("- "); printnum(fabs(b));
    }
    else if (b > 0.0) {
      printf("+ "); printnum(b);
    }
  }
}