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/* 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 corresp. y-coords y1 and y2
 *             on the graph of equation y = x^2 - 3x - 2.
 *             Calculate the slope m and the y-intercept b.
 *             Use m and b to print the line's equation.
 *             Print integers without a decimal point.
 * 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.\n");
   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:\n");
   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)\n", 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. */
   /* 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);
   }
}
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Lines through x^2 - 3x - 2.
Line through points: (2.10,-3.89),(-2.10,8.71)
Equation of line: Y = -3X + 2.41
Line through points: (0.50,-3.25),(3.75,0.81)
Equation of line: Y = 1.25X - 3.88
Line through points: (1.00,-4.00),(3.00,-2.00)
Equation of line: Y = X - 5
Line through points: (1.00,-4.00),(-2.00,8.00)
Equation of line: Y = -4X
Line through points: (-2.00,8.00),(4.00,2.00)
Equation of line: Y = -X + 6
Line through points: (2.00,-4.00),(2.00,-4.00)
Identical points.  There is no line.
Line through points: (0.00,-2.00),(4.00,2.00)
Equation of line: Y = X - 2
Line through points: (-1.00,2.00),(2.00,-4.00)
Equation of line: Y = -2X
Line through points: (-1.00,2.00),(4.00,2.00)
Equation of line: Y = 2
Line through points: (-0.50,-0.25),(3.50,-0.25)
Equation of line: Y = -0.25
Other lines:
Line through points: (2.00,3.00),(2.00,4.00)
Equation of line: X = 2
Line through points: (1.00,0.00),(3.00,0.00)
Equation of line: Y = 0
```