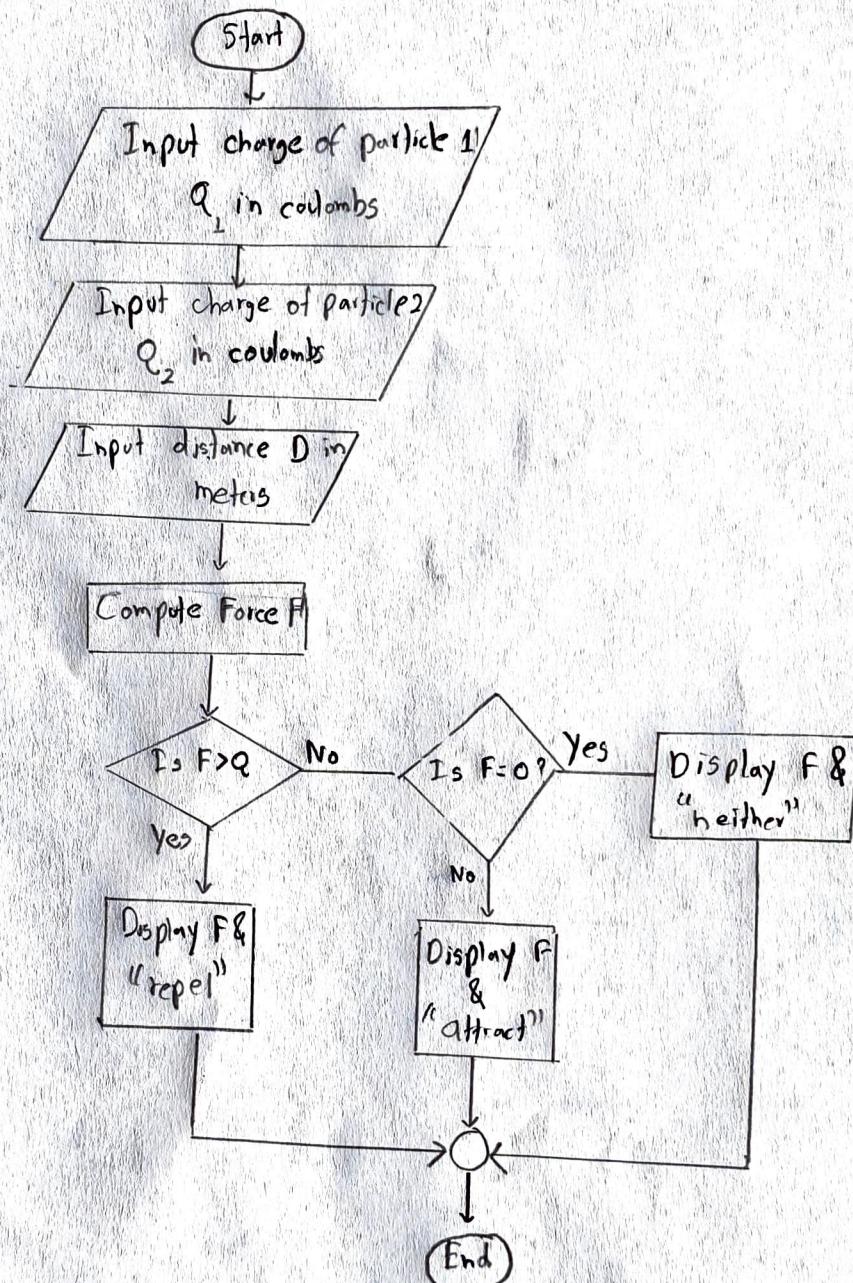


Problem Statement

Write a program that will determine the electrostatic force between two stationary charged particles, when given the charges of the particles Q_1 & Q_2 , a constant k and the distance D between the particles.

Diagram:Theory:

$$F = \frac{k Q_1 Q_2}{D^2}$$

Assumptions:

- ① The constant k given is exact
- ② D is always larger than one.

Solution

See file Spt_HW_Task1.gamagetd.vi

Verification

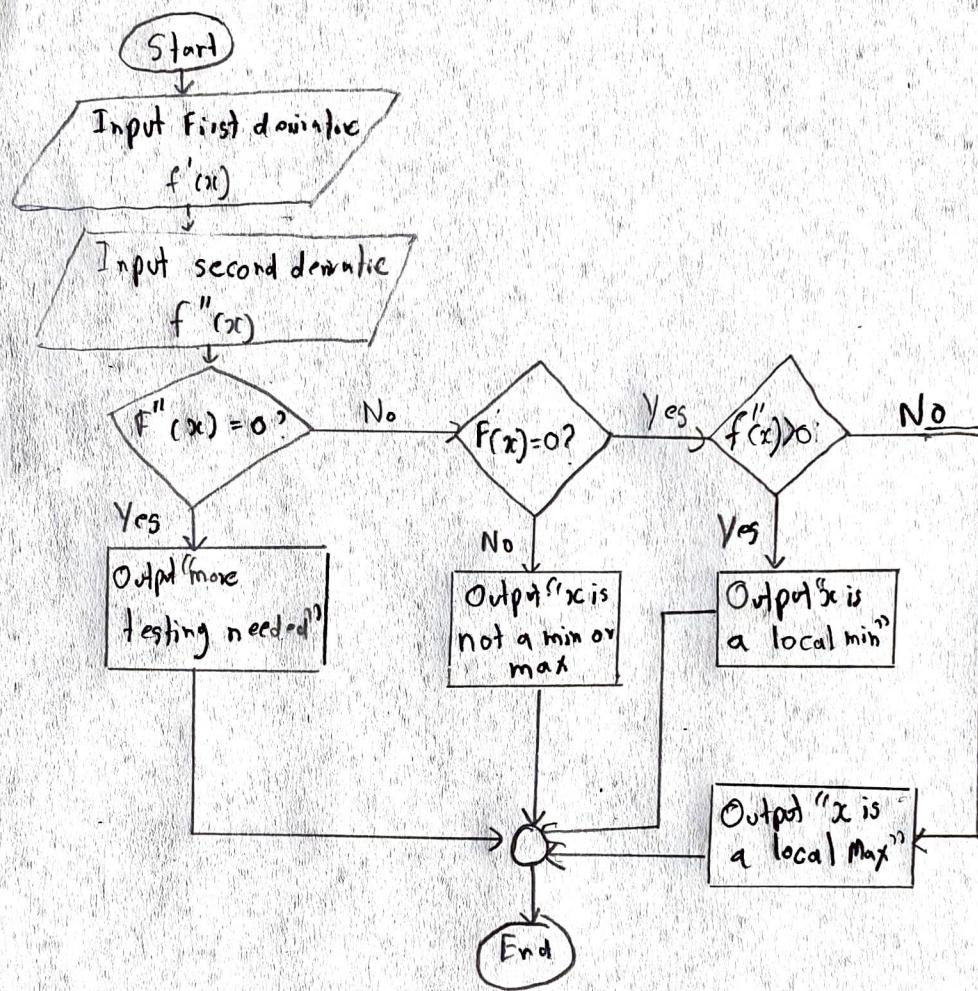
Test Case	Expected Value	Actual Value
$Q_1 = 5, Q_2 = 5, D = 1\text{m}$	$F = 2.25 \times 10^{11}$ Repel	$F = 2.25 \times 10^{11}$ Repel
$Q_1 = 8, Q_2 = 2, D = 5\text{m}$	$F = -5.16 \times 10^9$ Attract	$F = -5.16 \times 10^9$ Attract
$Q_1 = 0, Q_2 = 2, D = 5\text{m}$	$F = 0$ Neither	$F = 0$ Neither

 \Rightarrow PassConclusion:

The program determined the electrostatic force between 2 particles using the inputs given and depending on the sign of final answer, the program can determine if the particles will attract or repel each other.

Problem Statement

Write a program to determine if a point is a maximum or a minimum when given the inputs as the first and second derivative at that point.

Diagram:Theory:

First Derivative: $f'(x)$	Second Derivative: $f''(x)$	Result
Non-zero	Non-zero	x is not a min or max
zero	Positive (> 0)	x is a local min
zero	Negative (< 0)	x is a local max
Any value	Zero	Further testing needed

Assumptions

- ① The first & second derivatives are correct.

Solution

See 5p1-FW-Task2_gamage.td.vi

Verification

Inputs	Expected Output	Actual output
$f'(x)=2, f''(x)=0$	Further testing needed	Further testing needed
$f'(x)=0, f''(x)=1$	Local min	Local min
$f'(x)=0, f''(x)=-1$	Local max	Local max
$f'(x)=2, f''(x)=3$	Not a max or min	Not a max or min

\Rightarrow Pass

Conclusion: The program determines whether a point is a max, min, or neither by comparing the first derivative and second derivative to 0, and taking the signs of both to output the result.