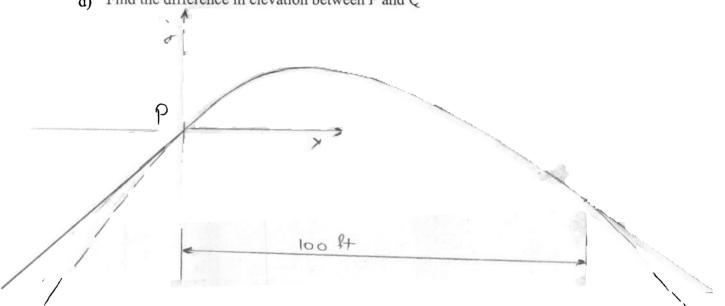
APPLIED PROJECT

Building a Better Roller Coaster

Suppose you are asked to design the first ascent and drop for a new roller coaster. By studying photographs of your favorite coasters, you decide to make the slope of the ascent 0.8, and the slope of the drop -1.6. You decide to connect these two straight stretches $y = L_1(x)$ and $y = L_2(x)$ with part of a parabola $y = f(x) = ax^2 + bx + c$, where x and f(x) are measured in feet. For the track to be smooth there can't be abrupt changes in direction, so you want the linear segments L_1 and L_2 to be tangent to the parabola at the transition points P and Q. (See the figure). To simplify the equations, you decide to place the origin at P.

- a) Suppose the horizontal distance between P and Q is 100 ft. Write equations in a, b, and c that will ensure that the track is smooth at the transition points.
- b) Solve the equations in part (a) for a, b, and c to find a formula for f(x).
- c) Plot L_1 , f, and L_2 to verify graphically that the transition are smooth.



Find the difference in elevation between F and C d)