Project 9: Using Quadratic Equations to Model Situations and Solve Problems Activity Sheet

Part 1: Equations of Two Lines and a Curve

Write an equation representing the line that passes through each pair of points.
1. $(3, 3)$ and $(5, 5)$

2. $(0, 4)$ and $(-4, 0)$

Solve this equation: $x + 1 = (x - 2)^2 - 3$. Show your reasoning.

Part 2: Analyzing a Dive

The function h, defined by $h(t) = -5t^2 + 10t + 7.5$, models the height of a diver above the water (in meters) t seconds after the diver leaves the board. For each question, explain your reasoning.
1. How high above the water is the diving board?

2. When does the diver hit the water?

3. At what point during her descent toward the water is the diver at the same height as the diving board?

4. When does the diver reach the maximum height of the dive?

5. What is the maximum height the diver reaches during the dive?

Part 3: A Linear Function and a Quadratic Function

Here are graphs of a linear function and a quadratic function. The quadratic function is defined by the expression $(x - 4)^2 - 5$.

Find the coordinates of P, Q, and R without using graphing technology. Show your reasoning.
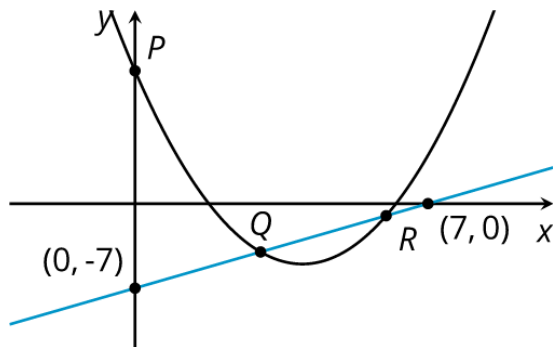
Part 4: Profit from a River Cruise

A travel company uses a quadratic function to model the profit, in dollars, that it expects to earn from selling tickets to a river cruise at d dollars per person. The expression $-d^2 + 100d - 900$ defines this function.

Without graphing, find the price that would generate the maximum profit. Then, determine that maximum profit.