Name: _____ Date: _____ IB Math A&A SL

Lesson 2.2 – Modeling & Optimization with Quadratic Functions

1. ***Physics*** - The path of a diver is given by
   $y = -\frac{4}{9}x^2 + \frac{24}{9}x + 12$

   Where y is the height (in feet) and x is the horizontal distance from the end of the diving board (in feet). What is the maximum height of the diver?

2. ***Economics*** – A textile manufacturer has daily production costs of $C = 100{,}000 - 110x + 0.045x^2$ where C is the total cost (in dollars) and *x* is the number of units produces. How many units should be produced each day to yield a minimum cost?

3. ***Finance*** – The profit *P* (in hundreds of dollars) that a company makes depends on the amount *x* (in hundreds of dollars) the company spends on advertising according to the model:
   $P = 230 + 20x - 0.5x^2$

   a. What expenditure for advertising will yield a maximum profit?

   b. What is the maximum profit?

4. ***Sports –*** A football kicker kicks a football a total distance of 150 feet. The ball reached a maximum height of 80 feet. Write an equation that models the height *y* to the distance *x*. (Assume that the motion of a projectile is quadratic).

5. ***Forensics*** – CSI detectives drop mannequins from a building to help them decide if a victim feel off a building or was pushed off of a building. A mannequin was lightly pushed out of an office 450 feet above ground level and landed 15 feet from base of the building. (Assume that the motion of a projectile is quadratic). Write an equation that models height *y* to the distance the mannequin travels *x*.

6. ***Geometry*** **-** The area of the shaded part is 112 cm^2. Solve for the value of x.