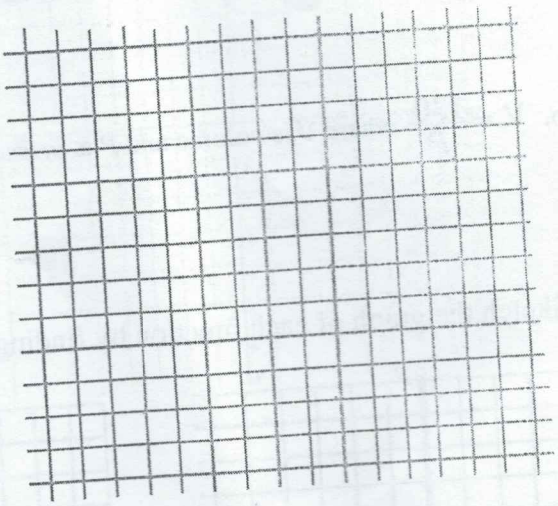
12. If the American Automobile company sells x cars, its profit is given by the function: $P(x) = -50x^2 + 14000x - 20000$ dollars. Use the information you obtain below to choose scales for each axis and sketch the graph of the profit function.



a. Find the number of cars that the company needs to sell in order for their profit to be maximized.

b. What is that maximum profit?

c. Find the horizontal intercepts of the profit function.

d. Interpret your result for part c.

13. The period of a pendulum (the time elapsed during one complete swing) is directly proportional to the square root of the length of the pendulum.

a. Express this proportionality with an equation.

b. If the pendulum length is doubled, what is the effect on the length of the period? Answer in a clear sentence and show complete and persuasive mathematical work.

c. Suppose a pendulum that is 3 feet long has a period of 0.5 seconds. Write the formula for period, P, as a function of length, L, of the pendulum.

d. Find the inverse formula, $L(P)$, and compose the two functions to demonstrate that they are truly inverse functions.

14. Write each rational expression in factored form. Reduce the expression if possible.

a. $\dfrac{15x^2}{3x^3 - 9x}$

b. $\dfrac{x^2 + 6x + 8}{2x^2 - 4x}$

c. $\dfrac{x^2 + 6x + 8}{x^2 - 4x - 5}$