THE GADGET COMPANY

A company sells gadgets. Assume that all the gadgets produced are sold.

P(x) is the profit (in dollars) where **x** is the number of gadgets that are produced and sold.

The profit is modeled by the function: $P(x) = -x^2 + 200x - 500$ *(Profit is a function of the number of gadget sold.)*

The **instantaneous rate of change** of profit (in dollars per gadget) is referred to as "marginal profit".

1. Use the **limit definition of derivative function** (not the shortcut) to find the function equation for marginal profit, **P'(x)**, the instantaneous rate of change of profit.
    Then find the marginal profit for **60 gadgets.**

2. Find the number of gadgets at which the marginal profit is **0 dollars per gadget**.
    Calculate the profit, in dollars, at that point.

3. In which interval of the number of gadgets is the marginal profit of dollars per gadget **positive**?

4. In which interval of the number of gadgets is the marginal profit of dollars per gadget **negative**?
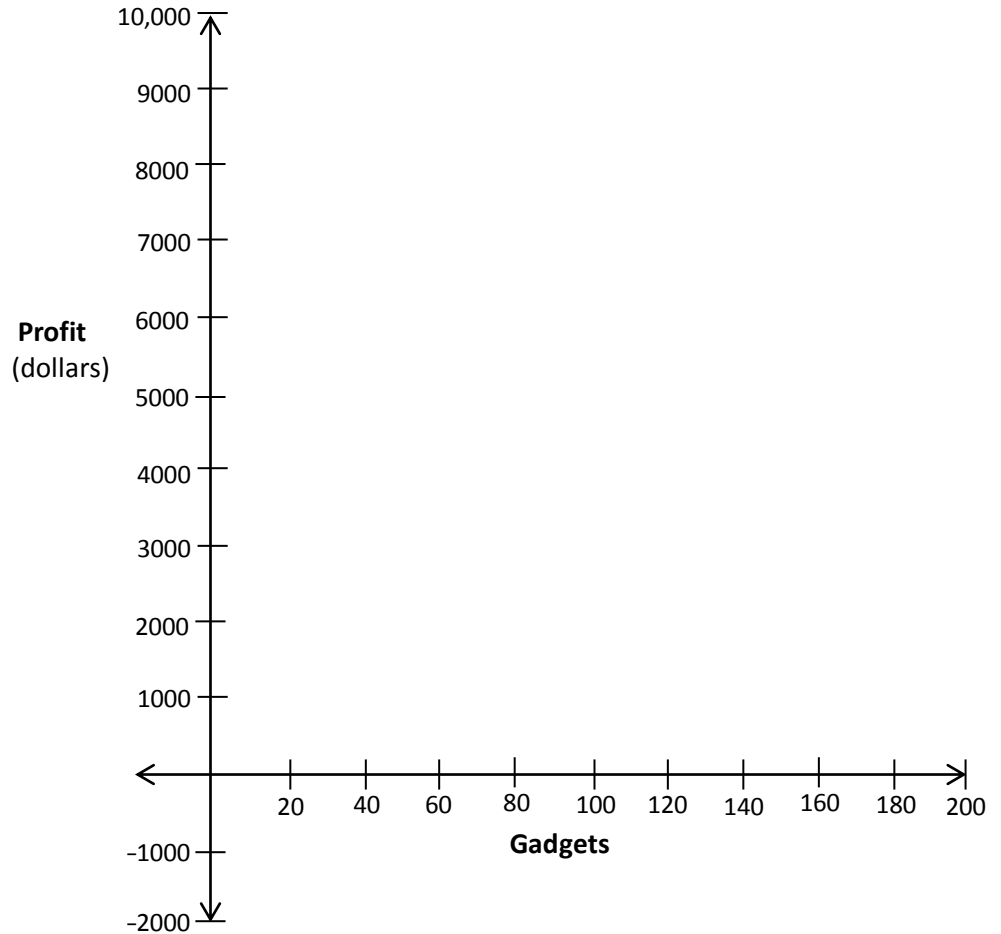
5. Complete the table of values for the profit function **P(x)** and for the marginal profit function **P'(x)**:

x	0	20	40	60	80	100	120	140	160	180	200
P(x)											
P'(x)											

6. Graph the function **P(x)**.

Find the equation for the tangent line at **(60, P(60))**. Then draw the tangent.

Draw the tangent line at the point where the tangent line is **horizontal**. Then label the coordinates of the point of tangency.

Profit (dollars)

10,000
9000
8000
7000
6000
5000
4000
3000
2000
1000
20 40 60 80 100 120 140 160 180 200
Gadgets
−1000
−2000

7. Graph the function **P'(x)**.

Circle the point **(60, P'(60))**.

Circle the point where **P'(x)=0**.

Marginal Profit (dollars per gadget)

200
150
100
50
20 40 60 80 100 120 140 160 180 200
Gadgets
−50
−100
−150
−200