Student: Arfaz Hossain **Date:** 11/14/21	**Instructor:** UVIC Math **Course:** MATH 100 (A01, A02, A03) Fall 2021 **Assignment:** Assignment 8

It costs 8 dollars to manufacture and distribute a backpack. If the backpacks sell at x dollars each, the number sold, n, is given by $n = \frac{3}{x-8} + 4(100 - x)$. Find the selling price that will maximize profit.

The cost of producing n backpacks is $8n.

The revenue from selling n backpacks is $nx.

Thus, the profit from selling n backpacks is $P = \$nx - 8n$.

To optimize profit, first simplify P(x).

$$\begin{aligned} P(x) &= nx - 8n \\ &= n(x-8) \\ &= \left[\frac{3}{x-8} + 4(100-x)\right](x-8) \\ &= 3 + 4(100-x)(x-8) \\ &= 3 + 400x - 3200 - 4x^2 + 32x \\ &= -4x^2 + 432x - 3197 \end{aligned}$$

Now, take the derivative of P(x).

$P'(x) = -8x + 432$

Set the derivative equal to 0 and solve.

$$\begin{aligned} -8x + 432 &= 0 \\ x &= 54 \end{aligned}$$

The second derivative of P(x), $P''(x) = -8$ is always negative. The price of $54 maximizes profit.