9. [10 points] Kiki and her mother, Fifi, are restarting their failed business selling half-sized eggs that weigh half as much as regular-sized eggs. Each regular-sized egg they buy is changed into a half-sized egg via size-change technology. Customers pay six times as much per pound for the small eggs as they do for regular-sized eggs. The regular-sized eggs cost \$1 per pound (for regular customers and for Kiki and Fifi). Suppose Kiki's shrinking machine costs \$500 to build, and each shrinking machine will shrink 300 pounds of regular-sized eggs to half-sized eggs before it breaks and Kiki needs to build a new one.

a. [2 points] If N is the number of pounds of half-sized eggs they sell, how much money will they receive from the sales (in terms of N)?

They will receive $6N$ dollars from sales.

b. [3 points] Suppose the function $P = G(N)$ gives the profit, total dollars from sales minus total expenses (including all regular-sized eggs purchased, and any machines built), from selling N pounds of half-sized eggs. Find $G(5)$, $G(150)$ and $G(151)$.

$G(5) =$ -480.

$G(150) =$ 100.

$G(151) =$ -396.

Solution: $G(5) = 6(5) - 2(5) - 500 = -480$.
$G(150) = 6(150) - 2(150) - 500 = 100$.
$G(151) = 6(151) - 2(151) - 1000 = -396$.

c. [5 points] Write a piecewise-defined formula for $G(N)$ for $0 < N \leq 400$.

$$G(N) = \begin{cases} 6N - 2N - 500 & \text{for} \quad 0 < N \leq 150. \\ 6N - 2N - 1000 & \text{for} \quad 150 < N \leq 300. \\ 6N - 2N - 1500 & \text{for} \quad 300 < N \leq 400. \end{cases}$$