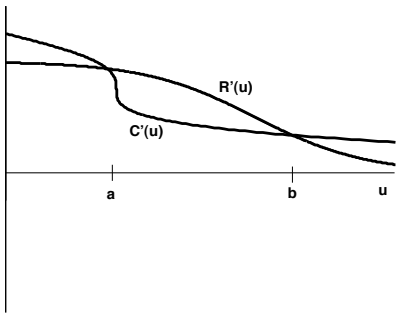
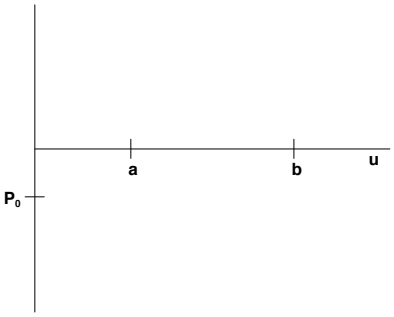
9. [12 points] The primary objective of most manufacturing companies is to produce and sell the number of units that will generate the maximum profit for the company. Let $R(u)$ define the revenue income the company earns when selling u units, and let $C(u)$ define the cost of producing u units. Then the profit, P, of selling and producing u units is determined by $P(u) = R(u) - C(u)$, where profit, revenue, and cost are all measured in dollars.

a. [4 points] When trying to determine if it is beneficial to produce and sell additional goods, companies will often consider the marginal revenue, defined by $R'(u)$, and the marginal cost, defined by $C'(u)$. Below is a sketch of one company's marginal revenue and marginal cost, as a function u units. On the same axes, sketch a graph of the company's marginal profit, $P'(u)$.



b. [4 points] Using your answer to part (a), sketch a graph of $P(u)$ on the axes provided below, given the conditions that $P(0) = P_0$ and $P(b) > 0$.



c. [4 points] Given that $\int_a^b R'(u)du = \$135,000$, $\int_a^b C'(u)du = \$64,000$, and the company's profit when selling b units is \$52,000, determine the company's profit when selling a units. Does the company make or lose money when selling a units?