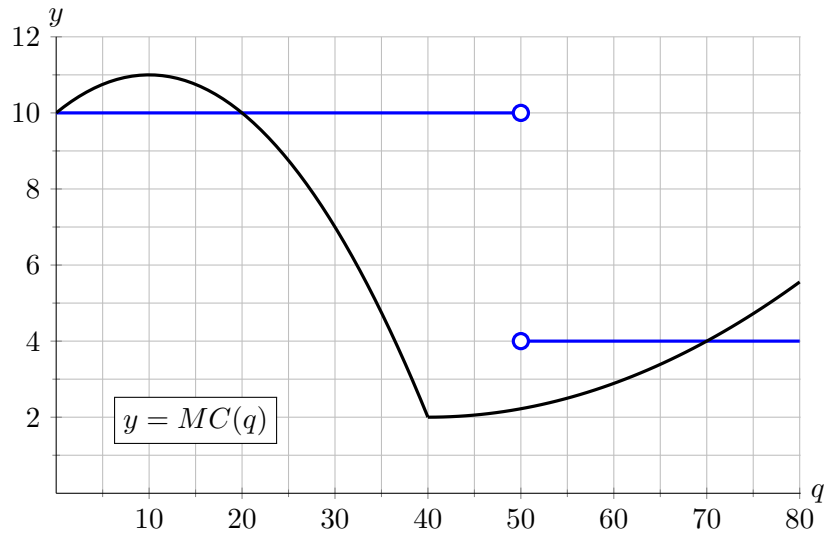


5. [10 points] Javier plans to make and sell his own all-natural shampoo. The graph below shows the marginal cost  $MC(q)$ , in dollars per liter, of  $q$  liters of shampoo. In order to start making shampoo, Javier must first spend \$25 on supplies, but he has no other fixed costs.



Javier can sell up to 50 liters of shampoo for \$10 per liter. Any additional shampoo can be sold to a local salon for \$4 per liter. Throughout this problem, you do not need to show work.

- a. [2 points] On the axes above, carefully sketch the graph of the marginal revenue  $MR(q)$ , in dollars per liter, of  $q$  liters of shampoo.

*Solution:* See above.

- b. [1 point] At what value(s) of  $q$  in the interval  $[0, 80]$  is marginal cost maximized?

**Answer:** 10

- c. [1 point] At what value(s) of  $q$  in the interval  $[0, 80]$  is cost maximized?

**Answer:** 80

- d. [2 points] At which values of  $q$  in the interval  $[0, 80]$  is profit increasing? Give your answer as one or more intervals.

**Answer:** (20, 70)

- e. [1 point] How many liters of shampoo should Javier make in order to maximize his profit?

**Answer:** 70

- f. [3 points] Write an expression involving integrals which represents the company's profit when  $q = 45$ . Your expression may involve  $MC(q)$  and/or  $MR(q)$ .

**Answer:**  $-25 + \int_0^{45} (MR(q) - MC(q))dq$