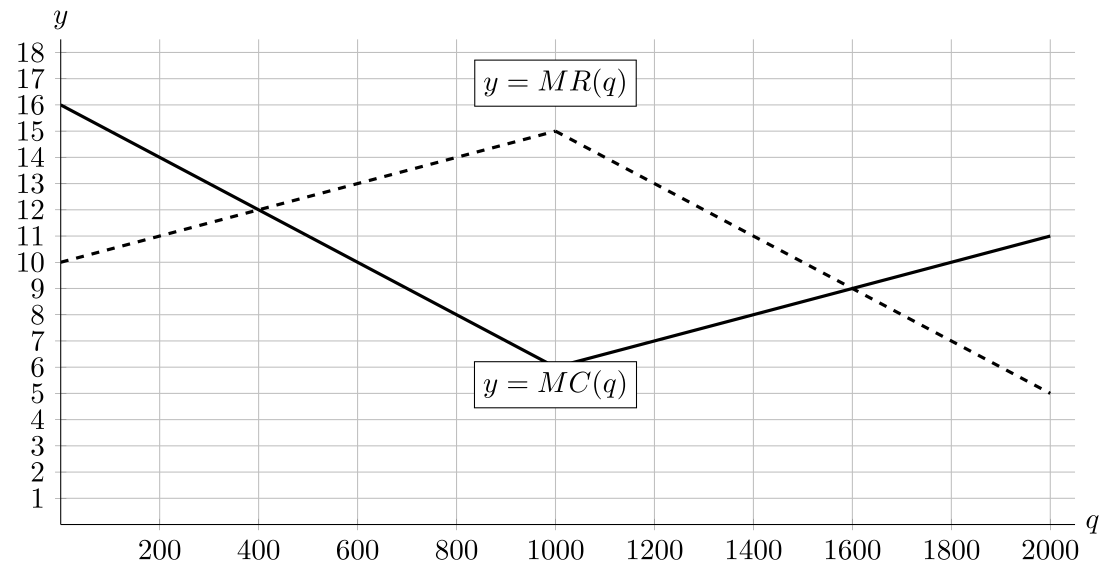
9. [13 points] The graph below shows the marginal revenue MR (dashed) and marginal cost MC (solid), in dollars per book, for Zelda to print q copies of a certain book. The machinery Zelda needs to start printing costs 800 dollars, but there are no other fixed costs.



You do not need to show work for this problem.

a. [1 point] At what value(s) of q in the interval $[0, 2000]$ is marginal revenue maximized?

Solution: $q = 1000$

b. [2 points] At what value(s) of q in the interval $[0, 2000]$ is cost minimized?

Solution: $q = 0$

c. [2 points] How many books should Zelda print in order to maximize her profit?

Solution: 1600 books

d. [2 points] At which values of q in the interval in the interval $(0, 2000)$ is profit concave up? Give your answer as one or more intervals.

Solution: $MR - MC$ is increasing for $0 < q < 1000$.

e. [3 points] Write an expression involving one or more integrals for Zelda's profit, in dollars, when she prints 1500 copies of her book. Your expression may involve $MR(q)$ and/or $MC(q)$. Do *not* attempt to evaluate the integral.

Solution: $-800 + \int_0^{1500} (MR(q) - MC(q))dq$

f. [3 points] Suppose that Zelda currently plans to print only 200 copies of the book. If she prints 800 copies of the book instead, will this increase or decrease profit? By how much?

Solution: The change is given by $\int_{200}^{800} (MR(q) - MC(q))dq$. This integral is given by computing the signed area between the curves. Noting that this area consists of two triangles, we can compute it exactly as $-300 + 1200 = 900$, so the profit will increase by 900 dollars.
Alternatively, we could count boxes. Depending on how we count, we find between 1 and 2 boxes between $q = 200$ and 400 and between 5 and 7 boxes between 400 and 800. Since each box has area 200, an estimate should give us an increase between 600 and 1200 dollars.