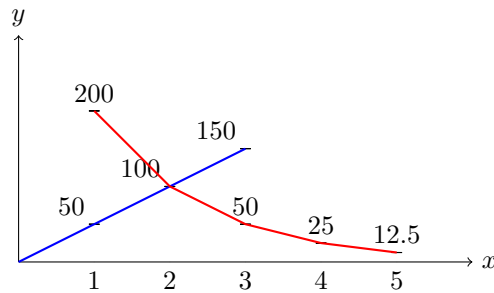# Optimal choice with costs and benefits

1. Suppose you can add random access memory (RAM) to your computer at a cost of 50$ per megabyte. Also suppose that the value of an additional megabyte of memory, measured by how much you are willing to pay, is 200$ for the first megabyte and then decreases by half for each additional megabyte. Graphically represent the cost and marginal benefit. How many megabytes should you buy?

2. Based on the previous problem, suppose the cost of RAM decreases to 25$ per megabyte. How many megabytes should you buy now? Also, suppose that the benefit of an additional megabyte increases to 400$ for the first megabyte and also decreases by half for each additional megabyte. How many megabytes should you buy now that the price is lower and the benefit is higher?

Solutions

1. The optimal choice occurs when the benefit equals the cost. That is, you will buy megabytes until the benefit of purchasing an additional megabyte is small enough that it is not worth it in relation to the cost.

   The red line represents the benefit and the blue line the cost. From the second megabyte onwards, the cost is higher than the benefit (150 > 50) and before the second megabyte, the benefit is higher than the cost (200 > 50). **Therefore, the optimal point is at 2 megabytes, since from there onwards it is no longer worth buying more megabytes.**

2. Now the cutoff point occurs after 3 megabytes. That is, at 3 megabytes, the benefit (red line) is greater than the cost (blue line). Beyond that, at 4 megabytes, the cost is greater than the benefit. **Therefore, you should buy 3 megabytes.**