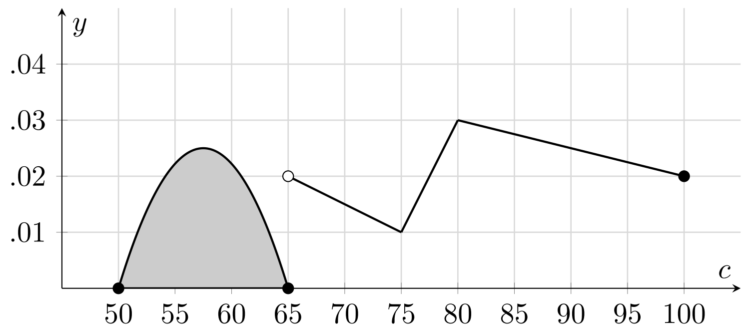
1. [6 points] Brad and Joan have developed a new strategy to analyze baseball players, except now instead of focusing on home run distance, they need to know the probability a pitcher throws a ball at a given speed. Shown below is a graph of the function $f(c)$, a probability density function (pdf) describing the probability a certain pitcher throws the ball at a speed of c miles per hour (mph). Assume that $f(c) = 0$ when $c \leq 50$ and $c > 100$.



a. [3 points] What is the probability this pitcher throws a pitch between 50 and 65 mph?

Solution: This probability is equal to $\int_{50}^{65} f(c)dc$, and so we are finding the area of the shaded region. Since the entire probability density is shown above, this area is equal to $1 - \int_{65}^{100} f(c)dc$. By breaking this area up into geometric shapes, we find that the area is 15 square units. Each unit has area equal to .05, so the total area is $15(.05) = .75$. Therefore, the final answer is $1 - .75 = .25$.

b. [3 points] What is the median speed of this player's pitches, in mph?

Solution: This can be done two ways. The first is finding M such that $\int_{50}^{M} f(c)dc = .5$. Using a), this is $.25 + \int_{65}^{M} f(c)dc = .5$, so this is equivalent finding $\int_{65}^{M} f(c)dc = .25$. Counting boxes shows that this happens at $c = 80mph$. The other way is to use the fact that $\int_{65}^{M} f(c)dc = .5$ is equivalent to $1 - \int_{M}^{100} f(c)dc = .5$. and so instead of counting boxes from left to right, we count boxes from right to left. This again gives the median as $80mph$.