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 $c > 100$.
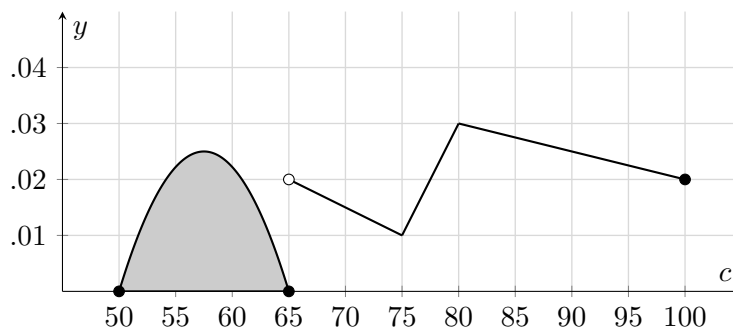
   a. [3 points] What is the probability this pitcher throws a pitch between 50 and 65 mph?

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

2. [7 points] Brad and Joan are examining another pitcher's probability density function (pdf) when Brad spills coffee on the paper and smudges some of the ink. After drying off the paper, they are left with the incomplete probability density function, $g(v)$ given below, where v is in **hundreds of miles per hour.**

$$g(v) = \begin{cases} r + qv & 0 < v \leq 1 \\ 0 & otherwise \end{cases}$$

Brad and Joan know that this player has a mean pitch speed of $\frac{2}{3}$ hundreds of miles per hour. Find the values of r and q which make this function a probability density function.

$r =$ _____ $q =$ _____