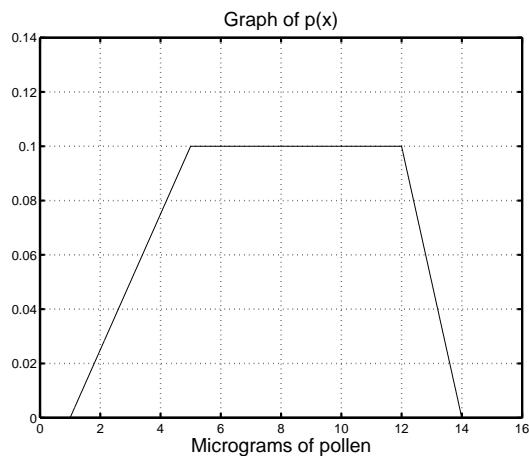**5.** (10 points) The number of micrograms x of pollen produced annually by plants of a certain species in a small forest has been determined (by experiment) to have a density function $p(x)$ whose graph is shown in the figure.

Graph of p(x)

(a) Write a definite integral whose value is the fraction of the plants that produce less than 10 micrograms of pollen each year.

$$\int_0^{10} p(x)\, dx \quad \text{where } p(x) \text{ is the function whose graph is given.}$$

(b) What fraction of the plant population produces less than 10 micrograms of pollen each year?

$$\int_0^{10} p(x)\, dx = \text{ area under graph between } x = 0 \text{ and } x = 10$$
$$= .2 + .5 = .7$$

or 70% of the population.

(c) Let $P(x)$ be the cumulative distribution function for this population. In terms of the population, what is the meaning of $P(13) - P(8)$?

$P(13) - P(8)$ *is the fraction of the population that produces between 8 and 13 grams of pollen each year.*

(d) What is the median number of micrograms of pollen produced by plants in this population?

The median is the value of T for which $P(T) = .5$, or the value of T so that the area under the graph of p between $x = 0$ and $x = T$ is equal to .5, which is also the area under the graph of p between $x = T$ and $x = 14$. This number is $T = 8$, since the area under the graph of p to the left of T is then $.2 + .3$ which the area under the graph to the right of T is also $.4 + .1 = .5$.