4. [7 points] Some of Flora's friends are hurt while the intruders are building the settlement. Flora and Nile are trying their best to heal them. Suppose $p(x)$ is the probability density function for the number of weeks, x, it takes for everyone to recover after intruders appear.

$$p(x) = \begin{cases} c & \text{if } 0 < x \le 1, \\ 2c & \text{if } 1 < x \le 3, \\ 0 & \text{else.} \end{cases}$$

a. [2 points] Find c.

b. [5 points] Let $W(x)$ be the cumulative distribution function for $p(x)$. Showing your work, give a piece-wise defined formula for $W(x)$ in the form given below.

$$W(x) = \begin{cases} \underline{\hspace{3cm}} & \text{if } x \le 0, \\ \underline{\hspace{3cm}} & \text{if } 0 < x \le 1, \\ \underline{\hspace{3cm}} & \text{if } 1 < x \le 3, \\ \underline{\hspace{3cm}} & \text{if } x > 3. \end{cases}$$

5. [12 points] Another function $f(t)$ given by

$$f(t) = \begin{cases} \frac{t}{6} & \text{if } 0 < t \le 2, \\ \frac{1}{3} & \text{if } 2 < t \le 4, \\ 0 & \text{else.} \end{cases}$$

is the probability density function for the number of months t that it will take the intruders to build the settlement.

   a. [3 points] Find the probability that it will take the intruders between 1 and 2 months to build the settlement.

   b. [5 points] Find the mean number of months it will take the intruders to build the settlement.

   c. [4 points] Find the median number of months it will take the intruders to build the settlement.