4. [8 points] The amount of time it takes a spider to build a web is t hours. The **cumulative distribution function** for t is given by:

$$J(t) = \begin{cases} 0, & \text{for } t \leq \frac{1}{2} \\ \frac{16}{9}\left(-\frac{1}{3}t^3 + \frac{5}{4}t^2 - t + \frac{11}{48}\right), & \text{for } \frac{1}{2} < t < 2 \\ 1, & \text{for } 2 \leq t \end{cases}$$

a. [2 points] What appears to be the shortest amount of time it could take the spider to build a web? Include units.

Answer: $\underline{\hspace{3cm} \frac{1}{2} \textbf{ hour} \hspace{3cm}}$

b. [2 points] What is the probability that it will take the spider more than 1 hour to build a web?

Answer: $\underline{\hspace{2.5cm} 1 - \frac{7}{27} \approx 0.74074 \hspace{2.5cm}}$

c. [4 points] Write an expression for the mean amount of time it takes the spider to build a web. Your answer may involve one or more integrals, but should not involve the letter J.

Answer: $\underline{\hspace{1cm} \displaystyle\int_{1/2}^{2} \frac{16t}{9}\left(-t^2 + \frac{5}{2}t - 1\right) dt \hspace{1cm}}$