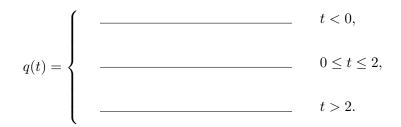
6. [10 points] Liban is writing songs using a new style of music which he calls "new-age jazz." The longer that he spends writing a particular song, the better it turns out.

Let Q(t) be the **cumulative distribution function** (cdf) for t, the number of days that it takes for Liban to write a particular song. The formula for Q(t) is shown to the right, where c > 0 is a constant. $Q(t) = \begin{cases} 0 & t < 0, \\ \frac{c}{4}t^2 & 0 \le t \le 2, \\ 2c - ce^{2-t} & t > 2. \end{cases}$

You do not need to show your work in this problem, but partial credit may be given for work shown.

a. [3 points] Write a piecewise-defined formula for q(t), the **probability density function** (pdf) corresponding to Q(t). Your answer may involve c, but it should not involve the letter Q.



b. [3 points] Write an expression involving one or more integrals that represents the **mean** number of days that it takes for Liban to write a particular song. Your answer may involve c, but it should not involve the letters Q or q. Do not evaluate your integral(s).

Answer:

c. [2 points] Use the fact that Q(t) is a cumulative distribution function to find the value of c.

Answer: *c* = _____

d. [2 points] Circle the one correct answer below that completes the following sentence:

"The quantity Q(5) represents...

- (i) ... the probability that it takes exactly 5 days for Liban to write a song."
- (ii) ... the probability that it takes more than 5 days for Liban to write a song."
- (iii) ... the probability that it takes 5 days or less for Liban to write a song."
- (iv) ...the approximate probability that it takes between 4.5 and 5.5 days for Liban to write a song."
- (v) NONE OF THESE