6. [9 points] As part of their training, once each week Littorina the snail attempts to travel as far as they can within one hour. Let $q(x)$ be the probability density function (pdf) that describes the total distance x, in centimeters, that Littorina manages to travel within an hour.

a. [3 points] Which of the following expressions represent the statement "*The median distance that Littorina travels in their training runs is 300 centimeters.*"? Circle **all** options which apply.

i. $q(300) = 0.5$

ii. $\displaystyle\int_0^{\infty} q(x)\ dx = 0.5$

iii. $\boxed{\displaystyle\int_0^{300} q(x)\ dx = 0.5}$

iv. $\displaystyle\int_0^{\infty} q(x)\ dx = 300$

v. $\displaystyle\int_0^{\infty} xq(x)\ dx = 300$

vi. $\displaystyle\int_0^{\infty} xq(x)\ dx = 0.5$

vii. $\boxed{\displaystyle\int_0^{300} q(x)\ dx = \int_{300}^{\infty} q(x)\ dx}$

viii. NONE OF THESE

b. [3 points] Circle the **one** statement below that is best supported by the equation

$$q(150) = 0.002.$$

i. The probability that Littorina travels exactly 150 centimeters is 0.002.

ii. Littorina travels 150 centimeters or fewer in approximately 0.2% of their training runs.

iii. Littorina travels between 150 and 151 centimeters in about 0.002% of their training runs.

iv. Every 150 seconds, Littorina travels roughly an extra 0.2 centimeters.

v. In their training runs, Littorina travels between 140 and 160 centimeters about 4% of the time.

vi. NONE OF THE ABOVE.

c. [3 points] Let $Q(x)$ be the cumulative distribution function (cdf) which corresponds to $q(x)$. Suppose that 10% of the time, Littorina travels less than 90 centimeters. Additionally, suppose that 27% of the time, Littorina travels more than 500 centimeters. What is the value of $Q(500) - Q(90)$? Circle **one** option below.

i. 17

ii. 37

iii. 63

iv. 83

v. 0.17

vi. 0.37

vii. 0.63

viii. 0.83