

Solution for exercise 8.2.1 in Karlin and Pinsky

Using the calculation rules we know for conditional probabilities we get for $0 < a < b$

$$\begin{aligned} & P(B(z) \neq 0, z \in (t, t+b] | B(z) \neq 0, z \in (t, t+a]) \\ = & \frac{P(B(z) \neq 0, z \in (t, t+a] | B(z) \neq 0, z \in (t, t+b]) \cdot P(B(z) \neq 0, z \in (t, t+b])}{P(B(z) \neq 0, z \in (t, t+a])} \\ = & \frac{1 - \frac{2}{\pi} \arccos \sqrt{\frac{t}{t+b}}}{1 - \frac{2}{\pi} \arccos \sqrt{\frac{t}{t+a}}} \end{aligned}$$