Answer on Question #40654, Math, Statistics and Probability

A subway train in a certain line runs after every half hour, between every midnight and 6 in the morning. What is the probability that a man entering the station at random will have to wait at least 20 minutes?

Solution

Let X denote the waiting time in minutes for the next train. Under the assumption that a man arrives at the station at random time, X is uniformly distributed on $(0, 30)$ with probability distribution function

$$f(x) = \begin{cases} \frac{1}{30}, & 0 < x < 30 \\ 0, & Otherwise \end{cases}$$

The probability that he has to wait at least 20 minutes

$$P[X > 20] = \int_{20}^{30} f(x)\, dx = \frac{1}{30}(30 - 20) = \frac{1}{3}.$$

Answer: $\mathbf{\frac{1}{3}}$.