1. (20) Suppose we roll our usual three-sided die, with probabilities $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{6}$ of coming up 1, 2 or 3 dots, respectively. Let $X$ denote the number of dots. Find $h_X(2)$. Express your answer as a single common fraction.

2. (25) Write R code (but not simulation) that computes the value of

$$\int_{27}^{30} \frac{1}{\sqrt{2\pi \cdot 5}} e^{-0.5\left(\frac{t-28}{\sqrt{5}}\right)^2} dt$$

3. (25) Consider the disk performance example on p.76. We will scale things so that the track number is a continuous value in $[0,1]$. Fill in the gaps in the following code, which finds the (approximate) mean time to satisfy a disk access request. The arguments `fullsweep` and `fullrotate` are the time needed to go from track 0.0 to track 1.0, and the time needed to make one revolution of the disk, respectively.

```r
disksim <- function(naccesses, fullsweep, fullrotate) {
  currtrack <- 0.5
  oldtrack <- 0.5
  sumacctime <- 0.0
  for (i in 1:naccesses) {
    currtrack <- runif(1)
    seek <- abs(currtrack - oldtrack)
    oldtrack <- currtrack
    seektime <- seek * fullsweep
    rottime <- runif(0, fullrotate)
    sumacctime <- seektime + rottime
  }
  return(sumacctime/naccesses)
}
```

4. Consider the following variant of the bus ridership example on p.20 and our current homework. The probability that a passenger alights is now $q$ instead of 0.2, and the number of new passengers who wish to board the bus at a stop, $N$, is now assumed to have a Poisson distribution with parameter $\lambda$. The capacity of the bus is still $c$. Answer the following, using expressions in $c$, $q$, $\lambda$ and the stationary probability vector $\pi$ (you may not need them all).

(a) (15) Find the transition probabilities $p_{00}$ and $p_{21}$.

(b) (15) Let $S$ denote the number of stops that a passenger travels. If for instance she boards at stop 3 and alights at stop 8, then $S = 5$. Find $\text{Var}(S)$.

Solutions:

1. $h_X(2) = \frac{p_X(2)}{1 - F_X(1)} = \frac{1/3}{1 - 1/2} = 2/3$