Test 1 Purdom
2-24-03 B503 Analysis of Algorithms

For the first two questions, assume that a disk drive needs $|i-j|$ units of time to move from track j to track i. To read track i it needs one unit of time plus the time to move to track i. Assume the head starts on track 1.

1. How long does it take to read tracks 1 to n in order?
2. How long does it take to read track 1, 1, 2, 1, $\ldots n-1$, 1, n? (In other words, to read each track but going back to reread track 1 each time.)
3. Suppose you flip a true coin four times. What is the probability that the flips result in at least three heads?
4. Suppose you flip a true coin five times. What is the probability that the first four flips do not result in three or more heads, but the last four flips result in three or more heads?
5. One can write H_n, where
$$H_n = \sum_{1 \le i \le n} \frac{1}{i}$$
as a fraction, a/b, where a and b are integers. Give a formula for b.
6. The answer to the previous question is not unique, because if the pair $[a, b]$ is an answer, then so is $[ka, kb]$ for any integer k. Give a formula for the denominator (b) that is in lowest terms, and give a proof that it is in lowest terms.