Math 375

Week 11 Homework Due Thursday, April 7

Sections 6.2 and 6.4

Section 6.2, problems 1, 3, 11, 13, 19, 21, 38, 39

Hints:

38(c): $P(X = k)$ is the probability that it takes $k$ flips before the fifth head occurs. Hence the last flip is heads, and the previous $k - 1$ flips result in exactly 4 heads. There are $2^k$ possible ways to flip a coin $k$ times at random, and only $\binom{k-1}{4}$ ways to turn up the fifth head on the last flip, therefore $P(X = k) = \frac{\binom{k-1}{4}}{2^k}$.

38(d): With probability of heads $p$ and probability of tails $q = 1 - p$, we have $P(X = k) = \binom{k-1}{4} p^5 q^{k-5}$.

39(c): To simplify $P_X(t) = \sum_{k=5}^{\infty} \binom{k-1}{4} t^k$, start with

$$\frac{1}{(1 - x)^5} = \sum_{n=0}^{\infty} \binom{n+4}{4} x^n = \sum_{k=5}^{\infty} \binom{k-1}{4} x^{k-5} = x^{-5} \sum_{k=5}^{\infty} \binom{k-1}{4} x^{k}.$$ 

Section 6.4, problems 1, 3, 7, 11