

CS 141: Advanced Topics in Algorithms
Spring 2006
Homework Alan and Reid

Due: Thursday, April 27

1. [10 Points] **Proof of KMP's Linear Running Time!** Recall from class that the KMP algorithm has the following pseudocode:

```
KMP(P,T):
  pi=Compute-Prefix(P)
  q=0 // Number of characters we've matched so far
  for i=1 to n
    while q>0 && P[q+1]!=T[i]
      q=pi[q]
    if P[q+1]==T[i]
      ++q
    if q==m
      print "Pattern matched, starting at char " (i-m)
```

Given that `Compute-Prefix(P)` runs in $O(m)$ time, show that the rest of `KMP(P,T)` runs in $O(n)$ time and that the whole algorithm is therefore $O(m+n)$.