

Tutorial 1

ECSE210L

1. Calculate the time complexity of the following functions.

A) $i=0$

WHILE ($i < n$)

Statement 1 $\rightarrow O(1)$

Statement 2 $\rightarrow O(1)$

$i=i+1$

possible i values $0, 1, 2, 3, \dots, n$

$O(n)$ - time

B) $i=1$

WHILE ($i < n$)

Statement 1 $\rightarrow O(1)$

Statement 2 $\rightarrow O(1)$

$i=i*2$

possible i values

$1, 2, 4, 8, 16, \dots, 2^k \leq n$

$\therefore k = \log_2 n$

The loop runs for k - times

$\Rightarrow O(\log_2 n)$ - time

C) $i=0$

WHILE ($i < n$)

Statement 1 $\rightarrow O(1)$

Statement 2 $\rightarrow O(1)$

$i=i+3$

possible i values $0, 3, 6, 9, \dots, k \leq n$

where k is a multiple of 3.

In total, at most $\lceil n/3 \rceil$ - times the

loop runs.

$\therefore O(n)$ - time

D) $i=1$

WHILE ($i < n$)

Statement 1 $\rightarrow O(1)$

Statement 2 $\rightarrow O(1)$

$i=i*3$

possible i values

$1, 3, 9, 27, \dots, 3^k$, for some k

$\therefore k = \log_3 n \Rightarrow O(\log_3 n)$ - time

E) for $i=1$ to n

Statement 1 $\rightarrow O(1)$

$\rightarrow O(n)$ - time

F) for $i=1$ to n

for $j=1$ to n

Statement 1 $\rightarrow O(1)$

$O(n^2)$ - time

G) for i = 1 to n
for j = 1 to i
Statement 1

~~print~~ $1 + 2 + 3 + \dots + n$
 $= \frac{n(n+1)}{2}$
 $\therefore O(n^2)$ - time

H) if (c > k)
statement 1
else

\rightarrow Best case = $O(1)$

for i = 1 to n

statement 1

\rightarrow worst case $O(n)$ - time.