

Asymptotics is Fun!

- (a) Using the function `g` defined below, what is the runtime of the following function calls? Write each answer in terms of `N`.

```
1 void g(int N, int x) {
2     if (N == 0) {
3         return;
4     }
5     for (int i = 1; i <= x; i++) {
6         g(N - 1, i);
7     }
8 }
```

`g(N, 1): $\Theta(\quad)$`

`g(N, 2): $\Theta(\quad)$`

- (b) Suppose we change line 6 to `g(N - 1, x)` and change the stopping condition in the for loop to `i <= f(x)` where `f` returns a random number between 1 and `x`, inclusive. For the following function calls, find the tightest Ω and big O bounds.

```
1 void g(int N, int x) {
2     if (N == 0) {
3         return;
4     }
5     for (int i = 1; i <= f(x); i++) {
6         g(N - 1, x);
7     }
8 }
```

`g(N, 2): $\Omega(\quad)$, $O(\quad)$`

`g(N, N): $\Omega(\quad)$, $O(\quad)$`