Question 9 [1 Marks]

Consider the following C code segment

```
int f (int x)

{

      if (x < 1)  return 1;

      else return (f(x-1) + g(x))

}


int g (int x)

{

      if (x < 2) return 2;

      else return (f(x-1) + g(x/2));

}
```

Of the following, which best describes the growth of f(x) as a function of x?

A Linear

✓ Exponential

C Quadratic

D Cubic

Explanation

f(n) = f(n-1) + g(n) ---- 1
g(n) = f(n-1) + g(n/2) ---- 2

Putting the value of g(n) in equation 1,
f(n) = 2*f(n-1) + g(n/2)

So, we can derive the below equation,
f(n) > 2f(n-1)
=> f(n) > 2*2*f(n-2) ---- because f(n) > 2*f(n-1), so, f(n-1) > 2*2*f(n-2).... so on
=> f(n) > (2^n)f(1) --- here '^' denotes the exponent.
So, f(n) > Theta(2^n)

So, option B is true, exponential growth for f(x).