19CSE100 Problem Solving and Algorithmic Thinking
Recursion

There is an old nerd joke about recursion which goes as follows: *"To understand recursion you must first understand recursion"*

1. Write a *recursive* flowgorithm function `add(a,b)` to find the sum of two numbers given as input to the function.

   Hint: Adding `a` and `b` is equivalent to adding `1, b` times and when `b` becomes zero add `a` by returning `a`.

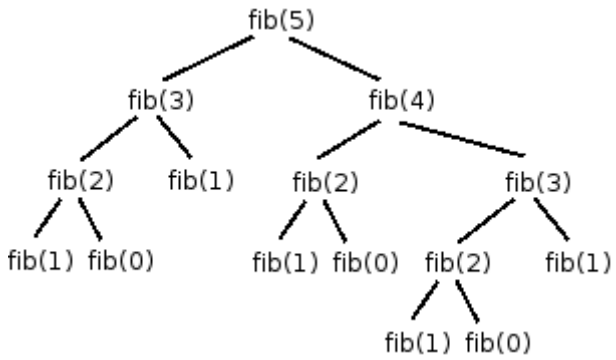
```
add(a,b)
 if (b==0)
    return a
 else
    sum = add(a,b-1)+1
 return sum
```

2. Write *recursive* flowgorithm function `isPrime(n,divisor)` that tests the primality of a given number.

   Hint: The upper limit for the `divisor` shall be `n/2` as you know. The recursive call keeps reducing the `divisor` checking the divisibility at each recursive call. If the divisibility check succeeds, `n` is not a prime number. If the divisor reaches `1`, then `n` is a prime number. You can consider using a flag to capture the binary possibility.

3. Write a *recursive* flowgorithm function `nthFibNum(n)` that computes the n^{th} Fibonacci number.

   Hint: Each Fibonacci number follows a pattern that is `fib(n) = fib(n-1)+fib(n-2)` with seed values as `fib(0)=1` and `fib(1)=1` where `fib(n)` represents n^{th} Fibonacci number. Using the above pattern if you notice taking `fib(5)` as an example as shown below, the seed values becomes base cases.



4. Write a *recursive* flowgorithm function `isEven(num)` to find whether a given number is even.

   Hint: If you successively subtract `2` from `num` and end up with a zero, `num` is an even number. If the successive subtraction ends with a `1`, `num` is an odd number. Isn't it?! So your recursive call should be `isEven(num-2)` till either `1` or `0` reaches which happens to be the base cases to decide the outcome.

5. Write a *recursive* flowgorithm function `printEvenOdd(start, end)` that prints even or odd numbers in a given range. Depening on your `start` value either even or odd gets printed. If you give `start = 1` then `1,3,5,7,9,...` should get printed till the `end`.

   Hint: Each successive recursive call should increment the `start` by `2` after printing it. The recursion should proceed as long as `start` is less than or equal to `end`.