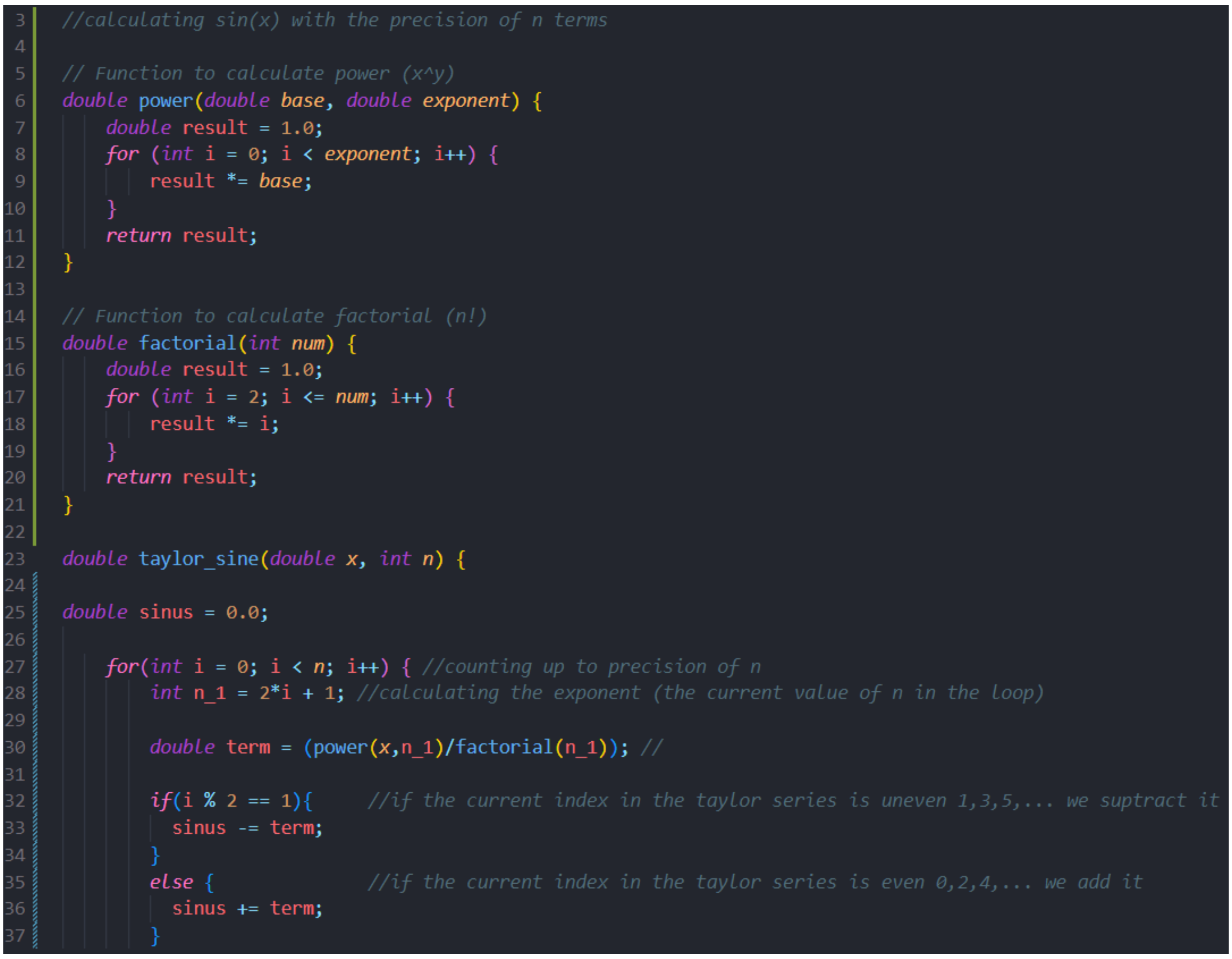
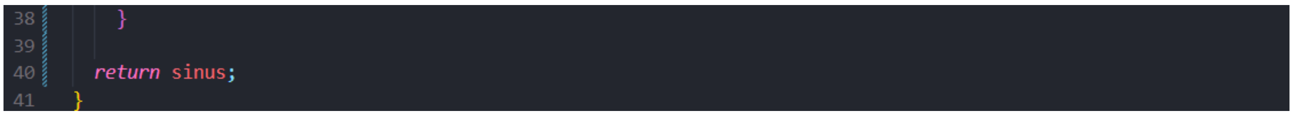
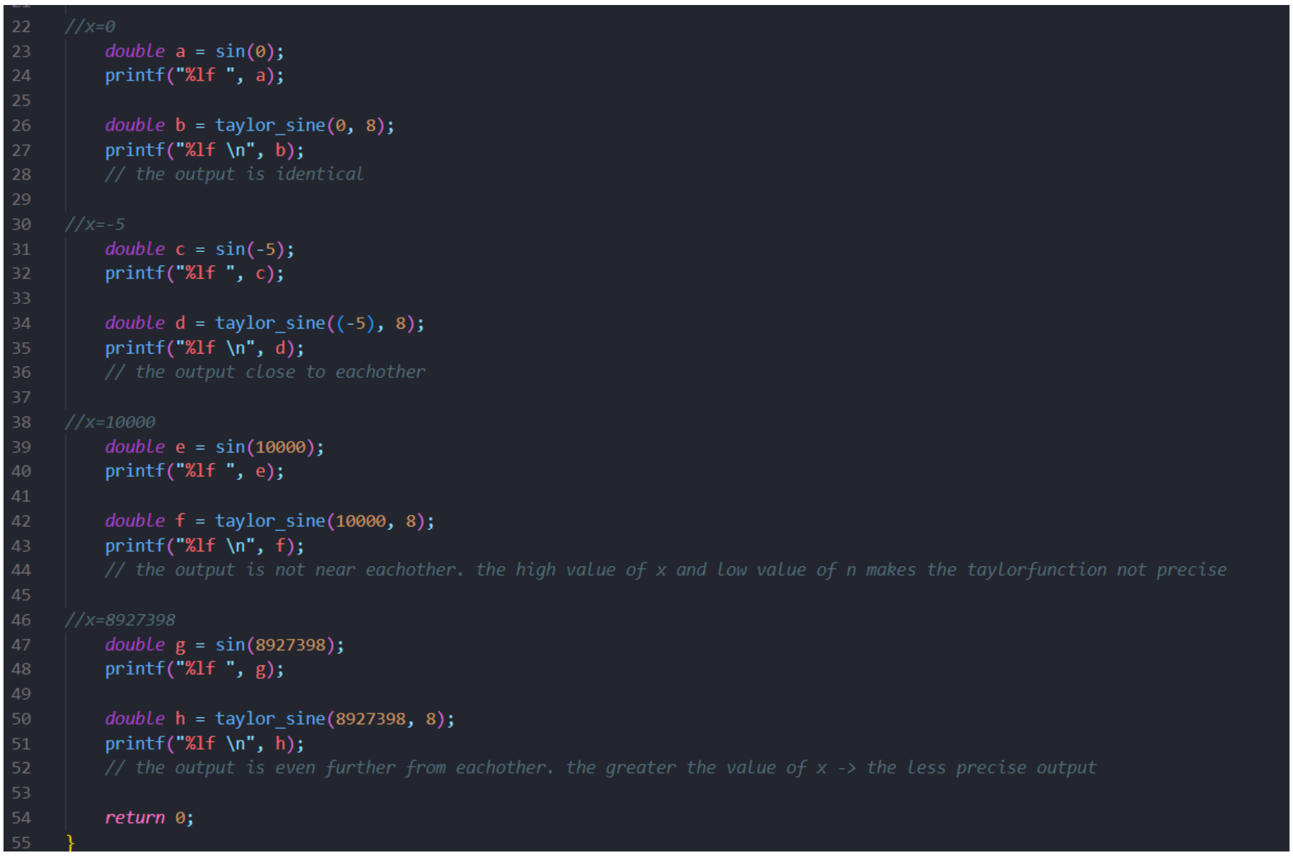
Opgave 1



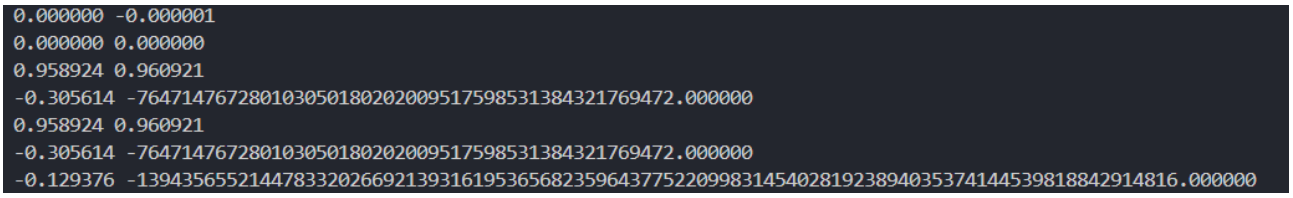
```c
//calculating sin(x) with the precision of n terms

// Function to calculate power (x^y)
double power(double base, double exponent) {
    double result = 1.0;
    for (int i = 0; i < exponent; i++) {
        result *= base;
    }
    return result;
}

// Function to calculate factorial (n!)
double factorial(int num) {
    double result = 1.0;
    for (int i = 2; i <= num; i++) {
        result *= i;
    }
    return result;
}

double taylor_sine(double x, int n) {

double sinus = 0.0;

    for(int i = 0; i < n; i++) { //counting up to precision of n
        int n_1 = 2*i + 1; //calculating the exponent (the current value of n in the loop)

        double term = (power(x,n_1)/factorial(n_1)); //

        if(i % 2 == 1){     //if the current index in the taylor series is uneven 1,3,5,... we suptract it
          sinus -= term;
        }
        else {              //if the current index in the taylor series is even 0,2,4,... we add it
          sinus += term;
        }
```



```c
    }

    return sinus;
}
```



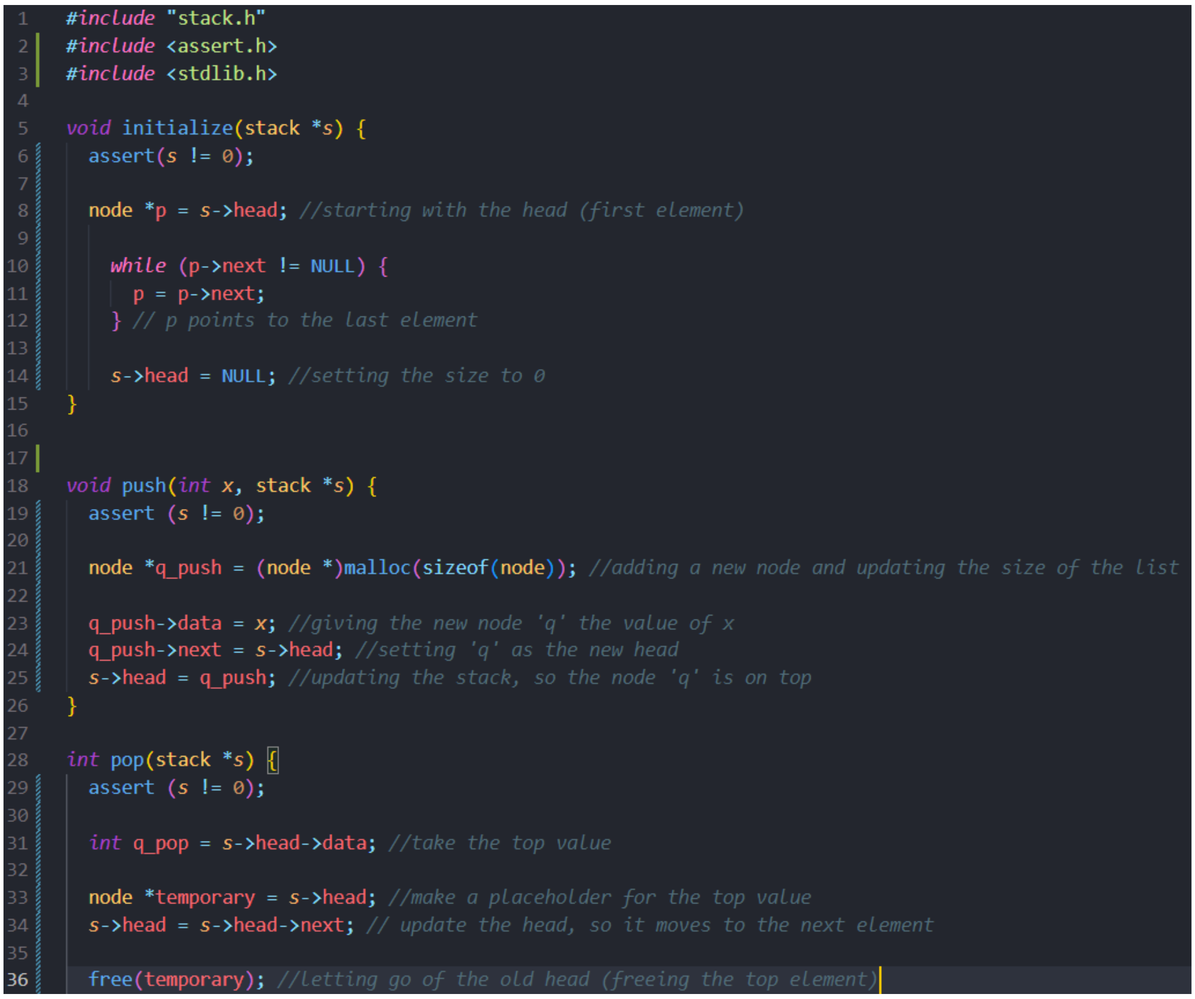
```c
//x=0
    double a = sin(0);
    printf("%lf ", a);

    double b = taylor_sine(0, 8);
    printf("%lf \n", b);
    // the output is identical

//x=-5
    double c = sin(-5);
    printf("%lf ", c);

    double d = taylor_sine((-5), 8);
    printf("%lf \n", d);
    // the output close to eachother

//x=10000
    double e = sin(10000);
    printf("%lf ", e);

    double f = taylor_sine(10000, 8);
    printf("%lf \n", f);
    // the output is not near eachother. the high value of x and low value of n makes the taylorfunction not precise

//x=8927398
    double g = sin(8927398);
    printf("%lf ", g);

    double h = taylor_sine(8927398, 8);
    printf("%lf \n", h);
    // the output is even further from eachother. the greater the value of x -> the less precise output

    return 0;
}
```



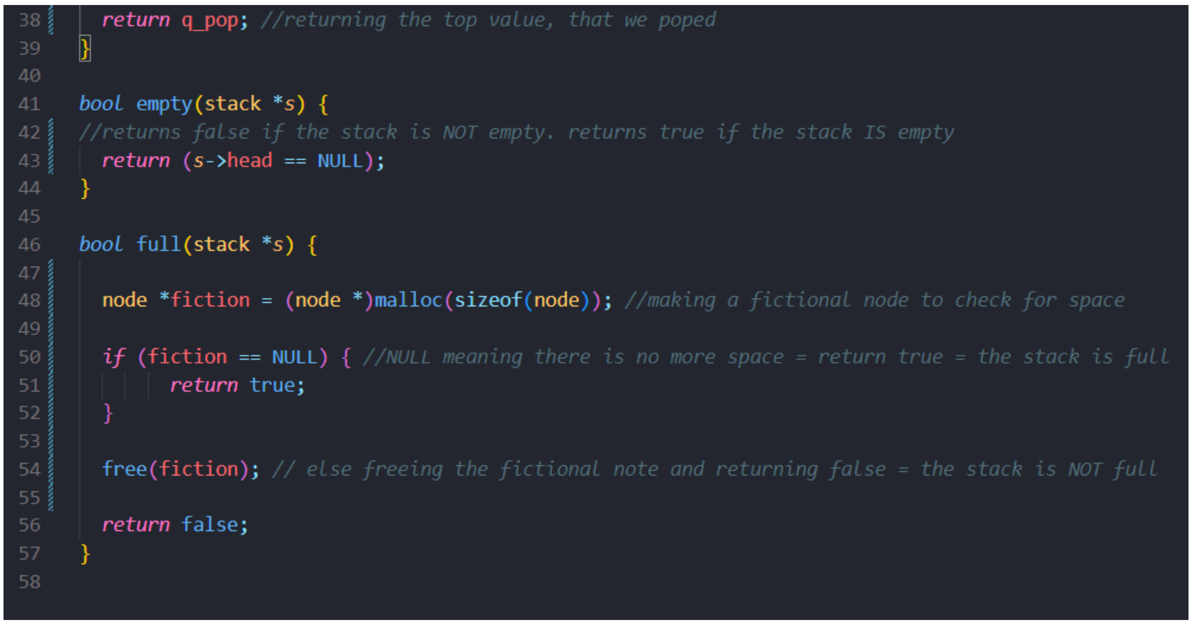
```
0.000000 -0.000001
0.000000 0.000000
0.958924 0.960921
-0.305614 -764714767280103050180202009517598531384321769472.000000
0.958924 0.960921
-0.305614 -764714767280103050180202009517598531384321769472.000000
-0.129376 -139435655214478332026692139316195365682359643775220998314540281923894035374144539818842914816.000000
```

Den er dårlig til høje tal, men små (både positive of negative) x værdier er okay.

Opgave 2

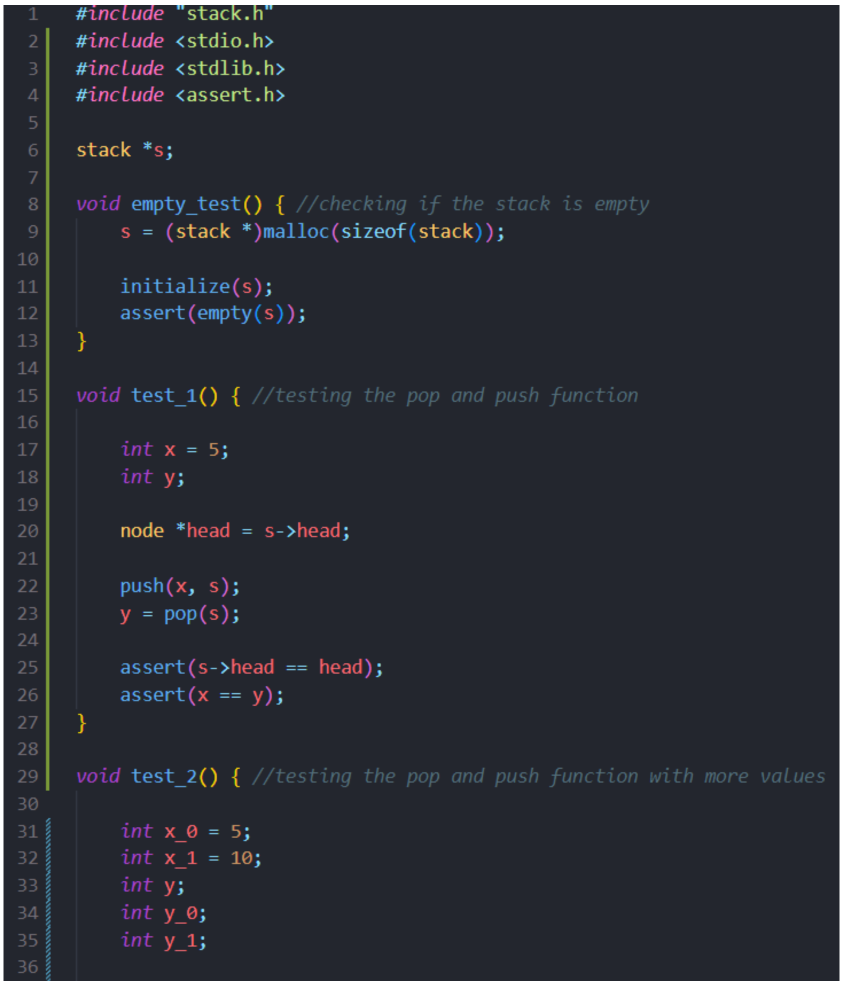


```c
#include "stack.h"
#include <assert.h>
#include <stdlib.h>

void initialize(stack *s) {
  assert(s != 0);

  node *p = s->head; //starting with the head (first element)

    while (p->next != NULL) {
      p = p->next;
    } // p points to the last element

    s->head = NULL; //setting the size to 0
}


void push(int x, stack *s) {
  assert (s != 0);

  node *q_push = (node *)malloc(sizeof(node)); //adding a new node and updating the size of the list

  q_push->data = x; //giving the new node 'q' the value of x
  q_push->next = s->head; //setting 'q' as the new head
  s->head = q_push; //updating the stack, so the node 'q' is on top
}

int pop(stack *s) {
  assert (s != 0);

  int q_pop = s->head->data; //take the top value

  node *temporary = s->head; //make a placeholder for the top value
  s->head = s->head->next; // update the head, so it moves to the next element

  free(temporary); //letting go of the old head (freeing the top element)
```

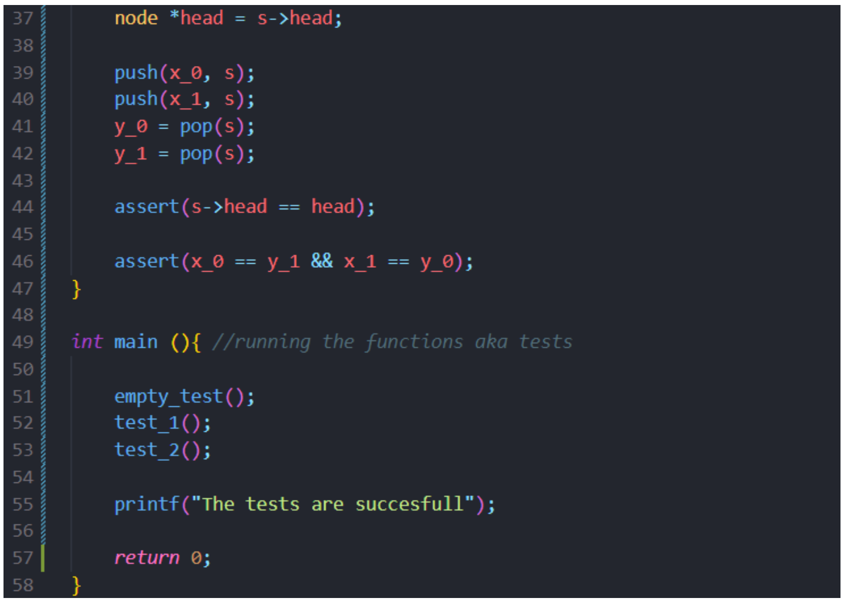


```c
  return q_pop; //returning the top value, that we poped
}

bool empty(stack *s) {
//returns false if the stack is NOT empty. returns true if the stack IS empty
  return (s->head == NULL);
}

bool full(stack *s) {

  node *fiction = (node *)malloc(sizeof(node)); //making a fictional node to check for space

  if (fiction == NULL) { //NULL meaning there is no more space = return true = the stack is full
      return true;
  }

  free(fiction); // else freeing the fictional note and returning false = the stack is NOT full

  return false;
}

```

2b



```c
#include "stack.h"
#include <stdio.h>
#include <stdlib.h>
#include <assert.h>

stack *s;

void empty_test() { //checking if the stack is empty
    s = (stack *)malloc(sizeof(stack));

    initialize(s);
    assert(empty(s));
}

void test_1() { //testing the pop and push function

    int x = 5;
    int y;

    node *head = s->head;

    push(x, s);
    y = pop(s);

    assert(s->head == head);
    assert(x == y);
}

void test_2() { //testing the pop and push function with more values

    int x_0 = 5;
    int x_1 = 10;
    int y;
    int y_0;
    int y_1;

```



```c
    node *head = s->head;

    push(x_0, s);
    push(x_1, s);
    y_0 = pop(s);
    y_1 = pop(s);

    assert(s->head == head);

    assert(x_0 == y_1 && x_1 == y_0);
}

int main (){ //running the functions aka tests

    empty_test();
    test_1();
    test_2();

    printf("The tests are succesfull");

    return 0;
}
```

Jeg kan ikke få lov at pushe min kode fordi githuben er puplic og den ikke vil give den min private mail 😊