CS2 lab 2 Report

Exercise 1

I wrote a code for a function calculating definite integral using trapez method. I used formula derived during lectures.

```
double trapez(double a, double b, int n, double(*fun)(double)){
   double result;
   double h = (b-a)/n;
   for(int i = 0; i < n; i++){
      result = result + (((*fun)(a)+(*fun)(h+a))*h/2);
      a += h;
   }
   return result;
}
```

Exercise 2

I wrote a code for a function calculating definite integral using simpson method. I used formula derived during lectures.

```
double simpson(double a, double b, int n, double(*fun)(double)){
   double result;
   double h = ((b-a)/n);

   for(int i = 0; i < n; i++){
```

```
        double c = (2*a+h)/2;
        result = result + ((((*fun)(a) + 4*(*fun)(c) + (*fun)(a+h)))/(6*n));
        a += h;
    }
    return result;
}
```

Exercise 3

```
double g(double x){
    double result = 1.0/(1.0+ x*x);
    return result;
}
```

Exercise 4 and 5

I declared variables a, b, n. I also made variables for storing value of integration using both methods. Then I calculated the exact value of integration of g(x) using math.h library, as integral of g(x) is arctangent. Later I derived errors.

I printed to file and plotted only integration by trapez method, because in Simpson rule we approximate 2nd order function(g) by 2nd order polynominal, so the error is always equal to 0.

```
int main(){
    FILE *fp = fopen("error of trapez","w");
```

```
    double a = 0;
    double b = 1;
    int n = 10;
    double result_trapez, result_simpson;
    result_trapez = trapez(a, b, n, g);
    result_simpson = simpson(a, b, n, g);
    printf("Result of trapez integration is: %lf", result_trapez);
    printf("\nResult of simpson integration is: %lf", result_simpson);
    double value = atan(1.0)-atan(0.0);
    printf("\nExact value of integer is: %lf", value);
    double error_trapez = 100*fabs(trapez(a, b, n, g)-value);
    double error_simpson = 100*fabs(simpson(a, b, n, g)-value);
    printf("\nErrors are %lf, %lf %", error_trapez, error_simpson);

    for(int i = 10; i <= 100; i+=10){
        error_trapez = 100*fabs(trapez(a, b, i, g)-value);
        fprintf(fp,"%lf\t%d\n",error_trapez,i);
    }
    fclose(fp);
}
```