CS 1713
Introduction to Computer Programming II
Midterm

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NAME:__________________________________________

Instructions
1. Do all of the 4 problems
3. You have 50 minutes for the exam
4. Show all your work
5. Do not separate midterm papers

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1. (30 pts) Complete the following program to find if there are two numbers in the array whose sum is 10. For example, the array \{1, 2, 3, 4, 5, 6\} has 4 and 6 at index positions 3 and 5 with respectively with sum 10. If there are multiple pairs with sum 10, just print one of them.

```c
#include <stdio.h>
#include <math.h>

int main()
{
    int i, j;
    double num[6];
    double sum = 10;
    int found = 0, first, second;

    printf("Enter 6 doubles\n");
    for (i=0; i<6; i++)
        scanf("%lf", &num[i]);

    for (i = 0; i < 6; i++)
        for (j = 0; j < 6; j++)
            if (num[i] + num[j] == sum)
                if (found == 0)
                    first = i;
                    second = j;
                    found = 1;
    if (found == 1)
        printf("num[\%d] and num[\%d] has desired sum\" \%first, \%second\"");
    else
        printf("none of the pairs have desired sum\n");
    return(0);
}
```
2. (20 pts) Trace the execution of the following program. What will be the final values of array a printed?

```c
#include <stdio.h>
#include <stdlib.h>

int main()
{
    int a[5]={1,2,3,4,5};
    int i,j,temp;

    for (j=1; j<5; j++)
        for (i=0; i<5-j; i=i+2)
            {
                printf("%d %d\n",i,i+j);
                temp = a[i];
                a[i] = a[i+j];
                a[i+j] = temp;
            }

    for (i=0; i<5; i++)
        printf("a[%d] = %d\n",i,a[i]);
}
```
3. (20 pts) What is the output of the following program? Show all your work for partial credit.

```c
#include <stdio.h>

int function1(int a, int b) {
    return(a+2*b);
}

int function2(int a) {
    return(2*a+1);
}

int main() {
    int i=2;
    int x;
    while (i<10) {
        if (i>5) {
            x = function1(i+1, i+1);
        } else {
            x = function2(i+1)-1;
        }
        printf("%d\n", x);
        i = i + 1;
    }
    return(0);
}
```

The output of the program is:

```
5 6 7 8 9 10 21 24 27 30
```
4. (30 pts) Write a **complete program** to compute the following expression. Read the value of \( n \) from the user and write a **single loop** to evaluate the expression. Do not use \texttt{pow} function in your program.

\[
\sum_{i=1}^{n} \frac{1}{2^i} - \sum_{i=1}^{n} \frac{1}{3^i} = \frac{1}{2} + \frac{1}{4} + \cdots + \frac{1}{2^n} - \frac{1}{3} + \frac{1}{9} + \cdots + \frac{1}{3^n} \\
= \left( \frac{1}{2} - \frac{1}{3} \right) + \left( \frac{1}{4} - \frac{1}{9} \right) + \cdots + \left( \frac{1}{2^n} - \frac{1}{3^n} \right)
\]

```c
#include <stdio.h>

int main()
{
    int n, i = 0;
    float sum, pow2, pow3;
    printf("Enter n\n");
    scanf("%d", &n);

    for (i=1; i<=n; i++)
    {
        sum = sum + pow2 - pow3;
        pow2 = pow2 * 1.0/2;
        pow3 = pow3 * 1.0/3;
    }

    printf("Sum = %f\n", sum);
    return(0);
}
```