CSci 1113
Midterm 1

Name: _____

Student ID: _____

Instructions: Please pick and answer any 7 of the 8 problems for a total of 70 points. If you answer more than 7 problems, only the first 7 will be graded. The time limit is 50 minutes. Please write your answers in the space provided. The exam is open book and notes. You may use electronic devices to ONLY look at either an e-book version or electronic notes. You may not use the internet, compiler or any other outside resources. (If you are typing on your keyboard/input device for anything other than ctrl-F to find words in the e-book or notes, this is probably not acceptable.)

Problem (1) [10 points] Write C++ code that will ask for three coefficients (a, b and c) for a degree 2 polynomial ($ax^2 + bx + c$). Then use the quadratic equation ($\frac{-b \pm \sqrt{b^2-4ac}}{2a}$) to display both roots. If there are no roots, also inform the user of this.

Problem (2) [10 points] The Alessandro numbers are a sequence of numbers where $A(n) = \begin{cases} \sqrt{A(n-1)}, & \text{if } n \text{ is odd} \\ 2 \cdot A(n-1), & \text{otherwise} \end{cases}$, where $A(0) = 1$. Thus, the next three numbers are: $A(1) = \sqrt{1} = 1, A(2) = 2 \cdot 1 = 2, A(3) = \sqrt{(2)} = 1.41421$. Write C++ code that asks for an n value, then output the nth Alessandro number.

Problem (3) [10 points] What is the output of this code?

```
int x = 3.4;
double y = x;
cout << x << y << endl;
y = x++/2;
cout << x << y << endl;
y = y / x;
cout << x << y << endl;
x%=2;
cout << x << y << endl;
x-3;
cout << x << y << endl;
```

Problem (4) [10 points] Write a single C++ if-statement for each part that is true for all the numbers shown and false for any numbers not shown. If there is a "..." this means that the pattern continues in that direction.
For example, if the numbers are "... -5, -4, -3, -2, -1", then the correct answer would be: $if(i < 0)$.

(1) ... -1, 0, 1, 2, 4, 5, 6, 7, 8 ...
(2) 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39
(3) ... -9, -8, -7, -6, 6, 7, 8, 9 ...
(4) 7, 11, 17, 21, 27, 31 ...
(5) 1, 2, 3, 5, 6, 7, 9, 10, 11, 13, 14, 15, 17, 18, 19, 21, 22, 23, 25, 26, 27, 29, 30, 31, 33, 34, 35, 37, 38, 39, 41, 42 ...

Problem (5) [10 points] Write a C++ program that reads in a sentence and outputs that sentence without vowels and spaces, along with counting how many vowels were removed. You may assume there will be only one period that occurs at the end of the sentence. Also assume that the vowels are always "a", "e", "i", "o" and "u" (not "w" or "y"). All letters will also be input in lower case.

Sample output for an input of "all work and no play makes aaron a dull boy.".

```
llwrkndnplymksrndllby.
Vowels removed:
13
```

Problem (6) [10 points] Make a C++ program that asks for a size, then prints a λ character of that size.

Example of size 3:

```
X
 X
X X
```

Example of size 4:

```
X
 X
 XX
X  X
```

Example of size 7:

```
X
 X
  X
   X
  X X
 X   X
X     X
```

Problem (7) [10 points] Write a C++ program that reads in a number, then re-displays that number with the following modifications: (1) all "7"s are instead "2"s before the period (if there is one) and (2) all "2"s are instead "7"s after the period.

Output for an input of "78"

```
28
```

Output for an input of "1234567890.0987654321"

```
1234562890.0987654371
```

Problem (8) [10 points] Find 3 errors in the code below. Assume that the code is completely shown except for #includes and "using namespace std". For each error, identify whether it is a runtime error, syntax error or logic error. You must also precisely describe why you think the part of code you identify is an error.

```
int main() {
    double height;
    string name;
    cout << "How tall are you in inches?" << endl;
    cin >> height;
    cout << "What is your full name?\n";
    getline(cin, name);
    if(height > 78) {
        cout << name << " is a giant! Praise the sun!\n";
    }
    if(height % 12 = 0) {
        cout << "You are exactly "<<height/12<<" feet tall!\n";
    }
    else {
        cout << "Meh... typical...\n";
    }
}
```