Math 201 - Test 1

February 22, 2011

Name _____

Score _____

Show all work. Supply explanations when necessary.

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1. (3 points) For small x, the sine of x can be closely approximated by x itself:

$$\sin x \approx x \quad \text{for small } x.$$

Using your calculator's value as the exact value, find the relative error made in using this idea to approximate $\sin 0.13$.

2. (3 points) Suppose $f(x) = 3 - \sqrt{x^2 + 9}$ is to be evaluated numerically for values of x that are close to zero. How should the expression be rewritten to avoid subtractive cancellation?

3. (3 points) Rewrite $P(x)$ in nested form and count the operations required in using the nested form to evaluate $P(2)$.

$$P(x) = 6x^4 + 4x^3 - 5x^2 + 2x + 1$$

4. (2 points) Give an example of a header line for a function that is sent an integer data type and returns an long double data type.

5. (2 points) If a, b, and c have all been assigned the value 3, what will their values be after the statement `a = b * ++c` is executed.

6. (4 points) Determine the value of each expression (true or false) assuming the following values have been set: `a = 5, b = 2, c = 4, d = 6` and `e = 3`.

   (a) `a != b`

   (b) `d / c == d / a`

   (c) `!(a * b) && (d > e)`

   (d) `(c / b * a) || (a % c * b)`

7. (3 points) Determine the exact output of the following program.

```
#include <iostream>
using namespace std;

int main()
{
   for ( int i = 20; i >= 0; i -= 4 )
      cout << i << " ";

return( 0 );
}
```

8. (3 points) Carefully explain why the following program will not compile. (Hint: The problem involves an idea that rhymes with rope.)

```
#include <iostream>
using namespace std;

int main()
{
   int sum = 0;

   for ( int i = 1; i <= 1000; i += 10 ) {
      sum += i;
      cout << i << "   " << sum << "\n";
   }

   cout << "\nThe last number is " << i;

   return( 0 );
}
```

9. (2 points) Rewrite each statement using a shortcut assignment operator.

   (a) `count = count + 5;`

   (b) `iquotient = iquotient / 2;`

10. (5 points) Find five compile-time errors in the following source code.

```
#include <iostream>
#include <cmath>
using namespace std;

int main( )
{
   const PI = 3.1415926535;
   long double myNum1, myNum2;
   double myNum3;

   1.57L = myNum2;

   cout << "Enter a number." << endl;
   cin >> mynum3;
   cout << "\n";

   myNum1 = myNum2 + long double( myNum3 );
   cout << sine( myNum1 );

   return( 0 )
}
```

11. (3 points) What would be the exact output of the following program?

```
#include <iostream>
#include <cmath>
using namespace std;

int main()
{
    float x = 1.5;

    cout << sin(x);
    cout << cos(x);

    return( 0 );
}
```

12. (3 points) Give the output of each statement. Assume all variables have been appropriately declared.

    (a) `cout << int( sqrt( 2.0 * 14.5 ) + 13.52 );`

    (b) `cout << "8 > 7 = " << (8 > 7);`

    (c) `cout << float( long( 18.7 ) + 18.7 );`

13. (2 points) Give an example of an expression that makes use of the operators `>=`, `&&`, and `==`, and has a value of zero.

14. (2 points) Give an example of an expression that makes use of the operators `<`, `||`, and `!`, and has a value of one.

15. (2 points) Write a `for` statement for the following case:

    Use a counter named `icnt` that has an initial value of 26, a final value of 4, and an increment of -2.

16. (3 points) When the following source code was printed, one line was unreadable. Give a single statement that is appropriate in its place.

```
#include <iostream>
#include <cmath>

int main( )
{
   float radius, area;

   cout << "Enter the radius of the circle." << endl;
   cin >> radius;

   if ( radius >= 0 )
   {
      ****************************************
      cout << "\nThe area of the circle is " << area << endl;
   }
   else
      cout << "A circle cannot have a negative radius." << endl;

   return( 0 );
}
```

17. (5 points) Write a complete C++ program that prompts for and accepts an integer as user input and returns a value of -1, 0, or 1 depending on whether the integer is negative, zero, or positive, respectively.