Sheet 3 – Functions

1. Consider these functions:

```
double k(double x) { return 2 * (x + 1); }
double h(double x) { return x * x + k(x) - 1; }
double g(double x) { return 4 * h(x); }
double f(double x) { return g(x) + sqrt(h(x)); }
```

Determine the results of the following function calls.

a. `double x1 = f(2);`
b. `double x2 = g(h(2));`
c. `double x3 = k(g(2) + h(2));`
d. `double x4 = f(0) + f(1) + f(2);`
e. `double x5 = f(-1) + g(-1) + h(-1) + k(-1);`

2. Write functions

```
double perimeter(float r);
double area(float r);
```

that compute the area and the perimeter of the circle c.

3. Write a predicate function

```
bool leap_year(int year)
```

that tests whether a year is a leap year: that is, a year with 366 days. Leap years are necessary to keep the calendar synchronized with the sun because the earth revolves around the sun once every 365.25 days. Actually, that figure is not entirely precise, and for all dates after 1582 the *Gregorian correction* applies. Usually years that are divisible by 4 are leap years, for example 1996. However, years that are divisible by 100 (for example, 1900) are not leap years, but years that are divisible by 400 are leap years (for example, 2000).

4. Consider the following procedure that is intended to swap the values of two integers:

```
void false_swap2(int a, int b)
{
	int temp = a;
	a = b;
	b = temp;
}

int main()
{
	int x = 3;
	int y = 4;
	false_swap2(x, y);
	cout << x << " " << y << "\n";
	return 0;
}
```

Why doesn't the procedure swap the contents of x and y? How can you rewrite the procedure to work correctly?

5. Without using functions, write a program that calculates and prints the values of y for all x values starting from 0 to 10 with step 0.1.

$$y(x) = \frac{m(x^2)+m(5x)}{|m(\sqrt{x})^{0.2}} \quad where\ m(x) = 7x^3 - 5x^2 + 2x + 11$$

6. Solve the previous problem using functions.
7. Write a function that checks if the given integer value is prime or not. The function should return 1 if the number is prime and 0 if not. The function should have the following prototype:

```
void isPrime(int x);
```