*** Submit the code (.scm file) on Canvas.

*** Required language: Scheme. Other languages are not allowed. There are 8 problems in total.

1. Given the following C code to compute the greatest common divisor of two integers:

```
int gcd(int u, int v) {
    if (v == 0) return u;
    else return gcd(v, u % v);
}
```

Rewrite the *gcd* function above in Scheme.

2. Given the following C code to compute the power a^b.

```
double power(double a, int b) {
    int i;
    double temp = 1.0;
    for (i = 1; i <= b; i++) temp *= a;
    return temp;
}
```

Rewrite the *power* function above in Scheme. Hint: you may want to rewrite it in recursion first.

3. The binomial coefficient is defined as follows for $n \geq 0$ and $0 \leq k \leq n$:

$$C(n,k) = \frac{n!}{(n-k)!\,k!}$$

Given the fact that: $C(n,0) = 1, \quad C(n,n) = 1$

$$C(n,k) = C(n-1,k-1) + C(n-1,k)$$

write a function to compute C(n, k).

4. Write a function to extract the nth element of a list.

5. Write a function to find the greatest element in an unsorted list of integers

6. Write a function to compute the intersection of two lists. For example, the intersection of '(2 3 4 5) and '(7 6 5 4) is '(4 5).

7. Write a **tail-recursive** function to compute the length of an arbitrary list.

8. Write a **higher-order** function *twice* that takes as a parameter a function of one argument and returns a function that represents the application of that function to its argument twice. Given the usual definition of the *square* function, what function is (*twice* (*twice square*))?