# hw10程式碼的思維與過程

以下是我的作業思路
我先將第一段要求先宣告出來

> 1. Assume there is a function declared as **(1) double power(double, int)** that calculates x n if we call power(x, n), a function declared as **(2) double multiply(double, int)** that calculate x*n if we call multiply(x, n), and a function declared as **(3) double divide(double, int)** that calculate x/n if we call divide(x, n), where x must be double and n be integer.

程式碼如下

```
#include<stdio.h>
#include<stdlib.h>
#include<string.h>
#include<math.h>

/*
 * 函式power回傳x^n
 * 首先處理n為負數的情況，將x替換成倒數，n轉正再傳入power()
 * 再來考慮到n=0的情況，直接回傳1
 * 再來考慮到n=1的情況，直接回傳x本身
 * 接下來使用遞迴計算x的n次方
 */
double power(double x, int n){
    if(n<0)  return power((double)(1/x),-n);
    if(n == 0) return 1.0;
    if(n == 1) return x;
    return (double)x*power(x,n-1);
}

// 函式multiply回傳x*n
double multiply(double x, int n){
    return (double)x*n;
}

// 函式divide回傳x/n
double divide(double x, int n){
    return (double)x/n;
}
```

接著按照第二三四段要求寫出powerpower()

> 2. Write a function **double powerpower(...)** that can compute (x^n )^ m , (x*n)^ m , (x/n)^ m , where powerpower() must use four parameters: a pointer to function, one double and two integers.
> 3. Also remember to write functions divide(), multiply() and power()
> 4. use **typedef to define a new type F** which is a pointer to function

程式碼如下

```

// 首先依照要求定義好函式指標F
typedef double (*F)(double,int);

/*
 * 函式powerpower()回傳所選的func(x,n)^m
 * 接下來依照第二點宣告powerpower()
 * 首先處理m為負數的情況，將x替換成倒數，m轉正再傳入函式中
 * 再來考慮到m=0的情況，直接回傳1
 * 計算func(x,n)，可能是power,multiply或divide x與n
 * 再使用迴圈的方式計算func(x,n)^m
 */
double powerpower(F func,double x,int n,int m){
    if(m < 0)
        return powerpower(func, (double)(1/x), n, -m);
    if(m == 0)
        return 1.0;
    double result = func(x,n);
    for(int i = 1;i<m;i++){
        result *= func(x,n);
    }
    return result;
}
```

接著按照第五段要求寫main函式

> When executing your program, you can choose the values for x, n, and m by using argc and argv.

程式碼如下

```

/*
 * 使用argc,argv，所需參數存在argv字串陣列中
 * 其中我另argv[1] = x
 *         argv[2] = n
 *         argv[3] = m
 * 因為其為字串，在傳參時我使用atoi轉為整數、atof轉為浮點數
 * 然後題目並無提到func的選擇方式，所以我將三種結果全部打印
 */
int main(int argc, char *argv[]){
    printf("-------- powerpower(power,x,n,m) --------\n");
    printf("%lf\n",powerpower(power,atof(argv[1]),atoi(argv[2]),atoi(argv[3])));
    printf("-------- powerpower(multiply,x,n,m) --------\n");
    printf("%lf\n",powerpower(multiply,atof(argv[1]),atoi(argv[2]),atoi(argv[3])
    printf("-------- powerpower(divide,x,n,m) --------\n");
    printf("%lf\n",powerpower(divide,atof(argv[1]),atoi(argv[2]),atoi(argv[3])))
}
```

以下是完整程式碼

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

typedef double (*F)(double,int);

double power(double x, int n){
    if(n<0)  return power((double)(1/x),-n);
    if(n == 0) return 1.0;
    if(n == 1) return x;
    return (double)x*power(x,n-1);
}

double multiply(double x, int n){
    return (double)x*n;
}

double divide(double x, int n){
    return (double)x/n;
}

double powerpower(F func,double x,int n,int m){
    if(m < 0) return powerpower(func, (double)(1/x), n, -m);
    if(m == 0) return 1.0;
    double result = func(x,n);
    for(int i = 1;i<m;i++){
        result *= func(x,n);
    }
    return result;

}

int main(int argc, char *argv[]){
    printf("-------- powerpower(power,x,n,m) --------\n");
    printf("%lf\n",powerpower(power,atof(argv[1]),atoi(argv[2]),atoi(argv[3])));
    printf("-------- powerpower(multiply,x,n,m) --------\n");
    printf("%lf\n",powerpower(multiply,atof(argv[1]),atoi(argv[2]),atoi(argv[3])
    printf("-------- powerpower(divide,x,n,m) --------\n");
    printf("%lf\n",powerpower(divide,atof(argv[1]),atoi(argv[2]),atoi(argv[3])))
}
```