Homework 6

Problem 1
Stack Frame of factorial. Following is the C code :

```
int rfact(int n);

int main()
{
	int n = 3;
	int result = rfact(n);
	return 0;
}

int rfact(int n)
{
	int result;
	if(n <= 1)
	{
		result = 1;
	}
	else
	{
		result = n * rfact(n - 1);
	}

	return result;
}
```

You can refer the 3.7.5.

Problem 2

Consider the following declaration:

```
short	S[5];
short	*T[4];
int	**U[6];
double	V[8];
char	*W[7];
```

Array	Size of Element	Size of Array	Start Address	Address of i-th Element
S			s	
T			t	
U			u	
V			v	
W			w	

Problem 3

Given a C function

```
1 int proc(void)
2 {
3 int x, y;
4 scanf("%x %x", &y, &x);
5 return x-y;
6 }
```

GCC generates following assembly codes:

```
1     proc:
2           pushl %ebp
3           movl %esp, %ebp
4           subl $24, %esp
5           addl $-4, %esp
6           leal -4(%ebp), %eax
7           pushl %eax
8           leal -8(%ebp), %eax
9           pushl %eax
10          pushl $.LC0          ;Pointer to string "%x %x"
11          call scanf
12          movl -8(%ebp), %eax
13          movl -4(%ebp), %edx
14          subl %eax, %edx
15          movl %edx, %eax
16          leave
17          ret
```

Assume stack pointer register and frame pointer register value are set as follows at the beginning of proc():

%esp 0x800040

%ebp 0x800060

And scanf reads 0x46 and 0x53 from stdin. String "%x %x" is stored at 0x300070 in memory.

Questions:

A. In line 3, what value is assigned to %ebp

B. Where are local variables x and y stored (Indicate their addresses)

C. What is the value of %esp after line 10

D. Draw a diagram to illustrate the stack frame after scanf returns
E. Indicate the unused stack frame of proc(). (p.s. these areas are allocated to improve the performance of high-speed cache)