

プログラム入門 レポート

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1 第 I 章

1.1 問 1-1

1.1.1 プログラム

```
#include <stdio.h>

int main(void) {
    printf("Hello \n World!");
}
```

1.1.2 実行結果

```
Hello
World!
```

1.1.3 考察

1.2 問 1-2

1.2.1 考察

1.3 問 1-3

1.3.1 プログラム

1.3.2 考察

1.4 問 1-4

1.4.1 プログラム

```
#include <stdio.h>

int main(void) {
    int ax, ay, az;
    int bx, by, bz;
    int n, g_1, g_2, g_3;
    printf("Input ax, ay, az \n");
    scanf("%d %d %d", &ax, &ay, &az);
    printf("Input bx, by, bz \n");
    scanf("%d %d %d", &bx, &by, &bz);

    n = (ax * bx) + (ay * by) + (az * bz);
    g_1 = (ay * bz) - (az * by);
    g_2 = (az * bx) - (ax * bz);
    g_3 = (ax * by) - (ay * bx);

    printf("内積: %d \n", n);
    printf("外積: (%d, %d, %d)\n", g_1, g_2, g_3);
}
```

1.4.2 実行結果

```
Input ax, ay, az
1 0 1
Input bx, by, bz
1 1 0
内積: 1
外積: (-1, 1, 1)
```

1.4.3 考察

1.5 問 1-5

1.5.1 プログラム

```
#include <stdio.h>

int main(void) {
    double ax, ay, az;
    double bx, by, bz;
    double n, g_1, g_2, g_3;
    printf("Input ax, ay, az \n");
    scanf("%lf %lf %lf", &ax, &ay, &az);
    printf("Input bx, by, bz \n");
    scanf("%lf %lf %lf", &bx, &by, &bz);

    n = (ax * bx) + (ay * by) + (az * bz);
    g_1 = (ay * bz) - (az * by);
    g_2 = (az * bx) - (ax * bz);
    g_3 = (ax * by) - (ay * bx);

    printf("内積: %lf \n", n);
    printf("外積: (%lf, %lf, %lf)\n", g_1, g_2, g_3);
}
```

1.5.2 実行結果

```
Input ax, ay, az
1.01 0 1.12
Input bx, by, bz
1.11 1.32 0
内積: 1.121100
外積: (-1.478400, 1.243200, 1.333200)
```

1.5.3 考察

1.6 問 1-6

1.6.1 プログラム

```
#include <stdio.h>
int main(void)
{
    double x, dx, dfdx_num;
    x = 1.0;

    printf("Input delta x .\n delta x = ");
    scanf("%lf", &dx);

    dfdx_num = ((x+dx) * (x+dx) * (x+dx) - (x*x*x)) / dx;

    printf("df/dx(x=1) = 3. delta x = %lf\n", dx);
    printf("Numerical value of df/dx = %lf\n", dfdx_num);
}
```

1.6.2 実行結果

```
Input delta x.
delta x = 0.1
```

```
df/dx(x=1) = 3. delta x = 0.100000
Numerical value of df/dx = 3.310000
```

```
Input delta x.
delta x = 0.01
df/dx(x=1) = 3. delta x = 0.010000
Numerical value of df/dx = 3.030100
```

```
Input delta x.
delta x = 0.001
df/dx(x=1) = 3. delta x = 0.001000
Numerical value of df/dx = 3.003001
```

```
IInput delta x.
delta x = 0.0001
df/dx(x=1) = 3. delta x = 0.000100
Numerical value of df/dx = 3.000300
```

1.6.3 考察

1.7 問 1-7

1.7.1 プログラム

```
#include <stdio.h>
int main(void)
{
    double x, dx, dfdx_num;
    x = 1.0;

    printf("Input delta x =");
    scanf("%lf", &dx);

    dfdx_num = ((x+dx) * (x+dx) * (x+dx) - (x*x*x)) / dx;

    printf("df/dx(x=1) = 3. delta x = %lf\n", dx);
    printf("Numerical value of df/dx = %lf\n", dfdx_num);
}
```

```
printf("Relative error |3.0 - df/dx| / 3.0 = %lf\n", ((3.0-dfdx_num)/3.0));  
}
```

1.7.2 実行結果

```
Input delta x.  
delta x = 0.1  
df/dx(x=1) = 3. delta x = 0.100000  
Numerical value of df/dx = 3.310000  
Relative error |3.0 - df/dx| / 3.0 = 0.103333
```

```
Input delta x.  
delta x = 0.01  
df/dx(x=1) = 3. delta x = 0.010000  
Numerical value of df/dx = 3.030100  
Relative error |3.0 - df/dx| / 3.0 = 0.010033
```

```
Input delta x.  
delta x = 0.001  
df/dx(x=1) = 3. delta x = 0.001000  
Numerical value of df/dx = 3.003001  
Relative error |3.0 - df/dx| / 3.0 = 0.001000
```

```
Input delta x.  
delta x = 0.0001  
df/dx(x=1) = 3. delta x = 0.000100  
Numerical value of df/dx = 3.000300  
Relative error |3.0 - df/dx| / 3.0 = 0.000100
```

1.7.3 考察

1.8 問 1-8

1.8.1 プログラム

```
#include<stdio.h>
```

```
#include <math.h>

int main(void){
double x, dx, dfdx_num;
x = 1.0;
printf("Input delta x. \n delta x = ");
scanf( "%lf", &dx);
    dfdx_num = (pow((x+dx),3.0) - pow((x-dx), 3.0)) / (2*dx);
printf("df/dx(x=1) = 3. delta x = %lf \n", dx);
printf("Numerical value of df/dx = % lf \n", dfdx_num);
    printf("Relative error |3.0 - df/dx| / 3.0 = %lf \n", fabs(3.0 - dfdx_num) / 3.0);
}
```

1.8.2 実行結果

```
Input delta x.
delta x = 0.1
df/dx(x=1) = 3. delta x = 0.100000
Numerical value of df/dx = 3.010000
Relative error |3.0 - df/dx| / 3.0 = 0.003333
```

```
Input delta x.
delta x = 0.01
df/dx(x=1) = 3. delta x = 0.010000
Numerical value of df/dx = 3.000100
Relative error |3.0 - df/dx| / 3.0 = 0.000033
```

```
Input delta x.
delta x = 0.001
df/dx(x=1) = 3. delta x = 0.001000
Numerical value of df/dx = 3.000001
Relative error |3.0 - df/dx| / 3.0 = 0.000000
```

```
Input delta x.
delta x = 0.0001
df/dx(x=1) = 3. delta x = 0.000100
Numerical value of df/dx = 3.000000
Relative error |3.0 - df/dx| / 3.0 = 0.000000
```

1.8.3 考察

1.9 問 1-9

1.9.1 プログラム

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

#define N 6

int main(void){

    double x, z, fx, f[N];
    int i, j;
    x = 1.0;
    z = 1.0;
    fx = exp(x);
    f[0] = 1.0;

    for(i = 1; i < 6; i++){
        z *= i;

        f[i] = f[i-1] + pow(x, i) / z;
    }

    for(j = 0; j < 6; j++){
        printf("exp(%lf) = %lf, %d order = %lf, error = %lf \n", x, fx, j, f[j], fabs((fx - f[j])/fx));
    }

}
```

1.9.2 実行結果

```
exp(1.000000) = 2.718282, 0 order = 1.000000, error = 0.632121
exp(1.000000) = 2.718282, 1 order = 2.000000, error = 0.264241
exp(1.000000) = 2.718282, 2 order = 2.500000, error = 0.080301
exp(1.000000) = 2.718282, 3 order = 2.666667, error = 0.018988
```



```
exp(1.000000) = 2.718282, 4 order = 2.708333, error = 0.003660  
exp(1.000000) = 2.718282, 5 order = 2.716667, error = 0.000594
```

1.9.3 考察

2 第 II 章

2.1 問 1-1

2.1.1 プログラム