Project: **p03**

Assignment: Project **p03** is a suite of programs. Program **p03a** finds the monthly payment. Program **p03b** finds the principal. Program **p03c** finds the term. Figure 1 illustrates the dialog produced by program **p03a**. Figure 2 shows the dialog produced by program **p03b** and figure 3 shows the dialog produced by program **p03c**. Input entered by the user is italicized and shown in bold.

You must employ functions similar to the example shown in figure 2 of lecture 13 to receive full credit for this project.

Discussion: Solve $R = P\frac{i}{1-(1+i)^{-n}}$ for P in program **p03b**. Solve $R = P\frac{i}{1-(1+i)^{-n}}$ for n in program **p03c**.

Implementation Requirements Implement prompts for principal, monthly payment, term, and interest using separate functions. Implement the calculation of payment in program **p03a**, the calculation of principal in program **p03b**, and the calculation of the term in **p03c** as separate functions.

Program Files: Project **3** consists of files **p03a.cpp**, **p03b.cpp**, and **p03c.cpp.**

Project files must be stored in the root directory of your student account. Failure to store project files in the root directory of your student account will result in a score of ***zero*** (***0***) for this project.

Command Line: Executable files **p03a**, **p03b**, and **p03c** are invoked with no program parameters as shown below.

$ p03a
$ p03b
$ p03c

Note: $R = P\frac{i}{1-(1+i)^{-n}}$

R: (rent) monthly payment
P: principal (amount borrowed)
i: monthly interest rate
n: number of months in the term

```
Enter the principal. 1000
Enter the APR. 8
Enter the number of years in the term. 1
Your monthly payment is $86.99.
```

Figure 1. Output format for program **p03a**.

```
Enter the monthly payment. 86.99
Enter the APR. 8
Enter the number of years in the term. 1
You can borrow $1000.02.
```

Figure 2. Output format for program **p03b**.

```
Enter the principal. 1000
Enter the monthly payment. 86.99
Enter the APR. 8
You must make payments for 12.00 months or 1.00 years.
```

Figure 3. Output format for program **p03b**.

Project: **p03d (10 points extra credit)**
You must make this program function correctly to receive the bonus for this program.

Assignment: Project **p03d** finds the monthly interest rate given principal, payment, and the term. Figure 4 shows the output produced by program **p03d**.

Discussion: There is no closed form expression $i = f(P, R, n)$ where P P is the principal, R is the payment, and n is the term given in months. The monthly interest rate i can be found using Newton's method.

Program Files: Project **p03d** consists of files **p03d.cpp.**

Command Line: Executable files **p03d** is invoked with no program parameters as shown below.
$ p03d

Note:
$$R = P\frac{i}{1-(1+i)^{-n}}$$
R: (rent) monthly payment
P: principal (amount borrowed)
i: monthly interest rate
n: number of months in the term

```
Enter the principal. 1000
Enter the monthly payment. 86.99
Enter the number of years in the term. 1
Your monthly interest rate is 0.006669.
Your APR is 8.00.
```

Figure 4. Output format for program **p03d**.