Chapter 1

1

Solve for y, where:

a.) $y = ln(e^5)$

5

b.) $y = ln(1/e)$

$y = ln(1/e) = ln(1) - 1 = 0 - 1 = -1$

c.) $y = ln(10e)$

$y = ln(10e) = ln(10) + ln(e) = ln(10) + 1$

```
log(10) + 1
```

```
[1] 3.302585
```

2

The nominal monthly rate for a loan is quoted at 5%. What is the equivalent annual rate? Semiannual rate? Continious rate?

```
effective_rate <- function(rate, periods) {
   ((1 + rate/periods)^periods - 1)
}
```

Annual:

```
effective_rate(.05, 12) * 100
```

```
[1] 5.11619
```

Semiannual:

```
effective_rate(.05, 2) * 100
```

```
[1] 5.0625
```

Continous:

```
log(1 + effective_rate(.05, 12)) * 100
```

```
[1] 4.989612
```

3

Over the course of a year, the log return on a stock market index is 11.2%. The starting value of the index is 100. What is the value at the end of the year?

```
100 * exp(.112)
```

```
[1] 111.8513
```

4

You have a portfolio of 10 bonds. In how many different ways can exactly two bonds default? Assume the order in which the bonds default is unimportant.

```
choose(10, 2)
```

```
[1] 45
```

5

What is the present value of a perpetuity that pays $100 per year? Use an actual discount rate of 4%, and assume the first payment will be made in exactly one year.

```
100 * (1/0.04)
```

```
[1] 2500
```

6

ABC stock will pay a $1 dividend in one year. Assume the dividend will continue to be paid annually forever and the dividend payments will increase in size at a rate of 5%. Value this stream of dividends using a 6% annual discount rate.

```
1 / (0.06 - 0.05)
```

```
[1] 100
```

7

What is the present value of a 10-year bond with a $100 face value, which pays a 6% coupon annually? Use an 8% discount rate.

```
present_value <- function(face, int.rate, periods, discount.rate) {
   delta <- 1/(1 + discount.rate)

   coupon <- face * int.rate

   discount <- (delta - delta^(periods+1)) / (1 - delta)

   coupon * discount + ( face / (1 + discount.rate)^periods )
}
```

```
present_value(100, .06, 10, .08)
```

```
[1] 86.57984
```

8

Solve for x, where $e^{e^x} = 10$

```
log(log(10))
```

```
[1] 0.8340324
```

9

Calculate the value of the following summation: $\sum_{i=0}^{9}(-0.5)^i$

```
r <- -0.5; n <- 9

(1 - r^n) / (1 - r)
```

```
[1] 0.6679688
```

10

The risk department of your firm has 10 analysts. You need to select four analysts to serve on a special audit committee. How many possible groupings of four analysts can be put together?

```
choose(10, 4)
```

```
[1] 210
```

long-hand:

```
n <- 10; k <- 4

factorial(10) / ( factorial(k) * factorial(n - k))
```

```
[1] 210
```

11

What is the present value of a newly issued 10-year bond with a notial value of $100 and a 2% annual coupon? Assume a constant 5% annual discount rate and no risk of default.

```
present_value(100, .02, 10, 0.05)
```

```
[1] 76.8348
```