Problem Set 1: Fundamental Objects

[5 pts] *Solutions that require an explanation should be type-written in a 12-point font and submitted in class. Please list the names of the contributors at the top of the first page. Display only the necessary R code and output, that is, only those that are referenced in your solutions. All R code and output should be displayed in a monospaced font, such as* `Courier`.

1. **[5 pts]** In contrast to the usual mathematical interpretation of $x = x + 1$, which has no finite solution, the following assignment evaluates to a finite value. Explain.

```
1 > x <- 0
2 > x <- x + 1
```

2. **[5 pts]** Demonstrate that the assignment in line 1 is successful, and explain the result in line 3.

```
1 > `1` <- 0
2 > 1
3 [1] 1
```

3. **[5 pts]** Explain the results of the comparisons in lines 3 and 5.

```
1 > x <- c(TRUE, FALSE)
2 > y <- c(0, 0)
3 > x & y
4 [1] FALSE FALSE
5 > x && y
6 [1] FALSE
```

4. **[5 pts]** Explain the results of following assignments.

```
1 > x = y = 1
2 > x <- y = 1
3 > print(x <- y <- 1)
4 > print(x = y = 1)
```

5. **[5 pts]** Explain the results of the following function calls.

```
1 > f <- function(a = 1, b) a + b
2 > f(b = 3, 2)
3 > f(3)
4 > f(b = 3)
```

6. R has many built-in functions for calculations involving probability distributions. There is an abbreviated name for every named probability distribution. For example, the abbreviated name for the normal distribution is `norm`, which is the root of the following function names:

`dnorm`	normal probability density function
`pnorm`	normal cumulative distribution function
`qnorm`	normal quantile function

   (a) **[2 pts]** Let X have a normal distribution with mean 100 and variance 100. Find the 90th percentile of X by calling the function `qnorm` in two ways: (i) specify the arguments by position, and (ii) specify the arguments by complete names.

   (b) **[2 pts]** Find $\mathrm{P}(X \geq 90)$ using the function `pnorm` in two ways: (i) without the use of the optional argument `lower.tail`, and (ii) with the use of the optional argument `lower.tail` but no additional arithmetic operation.