R Code to Complement Math Review Packet

Properties of Logarithms

Practice Problems.

1. Solve the following:

a. $log_e(e^x) = x$

```
# If x = 3

log(exp(3))
```

```
## [1] 3
```

b. $log_{10}(100) = 2$

```
log10(100)
```

```
## [1] 2
```

c. b. $log_{10}(\frac{1}{10}) = -1$

```
log10(1/10)
```

```
## [1] -1
```

d. b. $log_{10}(0) =$ No solution $

3c. $log_{10}(5) + log_{10}(2) = 1$

```
log10(5) + log10(2)
```

```
## [1] 1
```

Matrix Algebra

Type ?matrix in the **Condole** or matrix in **Help** to look at the inputs of the matrix function.

If we want to store the matrix we need to call it "A", for example and store the matrix.

For example $\mathbf{A} = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$ $\mathbf{B} = \begin{bmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{bmatrix}$

```
#Sorting by row
Z <- matrix(data = c(1,2,3,4,5,6,7,8,9),
            nrow = 3, ncol = 3,
            byrow = TRUE)

print(Z)
```

```
##      [,1] [,2] [,3]
## [1,]    1    2    3
## [2,]    4    5    6
## [3,]    7    8    9
```

```r
#Sorting by column
Y <- matrix(data = (1:9),
            nrow = 3, ncol = 3,
            byrow = FALSE)

print(Y)
```

```
##      [,1] [,2] [,3]
## [1,]    1    4    7
## [2,]    2    5    8
## [3,]    3    6    9
```

Practice Problems

1. Solve the following:

a. $\begin{bmatrix} 2 & 4 & 2 \\ 1 & 3 & 0 \\ 1 & 6 & 2 \end{bmatrix} + \begin{bmatrix} 1 & 5 & 0 \\ -2 & -3 & 0 \\ 1 & 9 & 5 \end{bmatrix} = \begin{bmatrix} 3 & 9 & 2 \\ -1 & 0 & 0 \\ 2 & 15 & 7 \end{bmatrix}$

```r
M1 <- matrix(data = c(2,4,2,1,3,0,1,6,2),
            nrow = 3, ncol = 3, byrow = TRUE)

M2 <- matrix(data = c(1,5,0,-2,-3,0,1,9,5),
            nrow = 3, ncol = 3, byrow = TRUE)

M1 + M2
```

```
##      [,1] [,2] [,3]
## [1,]    3    9    2
## [2,]   -1    0    0
## [3,]    2   15    7
```

b. $\begin{bmatrix} 2 & 1 \\ -2 & 2 \\ 4 & 2 \end{bmatrix} \begin{bmatrix} 5 & 2 & -1 \\ 3 & 4 & 2 \end{bmatrix} = \begin{bmatrix} 13 & 8 & 0 \\ -4 & 4 & 6 \\ 26 & 16 & 0 \end{bmatrix}$

```r
M3 <- matrix(data = c(2,-2,4,1,2,2),
            nrow = 3, ncol = 2,
            byrow = FALSE)

M4 <- matrix(data = c(5,3,2,4,-1,2),
            nrow = 2, ncol = 3,
            byrow = FALSE)

M3 %*% M4
```

```
##      [,1] [,2] [,3]
## [1,]   13    8    0
## [2,]   -4    4    6
## [3,]   26   16    0
```

c. Let A$= \begin{bmatrix} 1 & 2 \\ 3 & 5 \\ 4 & 0 \end{bmatrix} and B = \begin{bmatrix} 4 & 4 \\ 1 & 2 \\ 7 & 0 \end{bmatrix}$ Calculate $A^T B$