

```

> # This code is stored in the file
> #
> #      matrix.r
> #
>
> #-----
> # Add and subtract matrices
> #-----
>
> a<-matrix(c(3, 6, 2, 1),2,2,byrow=T)
> a
      [,1] [,2]
[1,]     3     6
[2,]     2     1
>
> aa<-matrix(c(3, 6, 2, 1),2,2,byrow=F)
> aa
      [,1] [,2]
[1,]     3     2
[2,]     6     1
>
> b<-matrix(c(7, -4, -3, 2),2,2,byrow=T)
> b
      [,1] [,2]
[1,]     7    -4
[2,]    -3     2
>
> a+b
      [,1] [,2]
[1,]    10     2
[2,]     -1     3
>
> a-b
      [,1] [,2]
[1,]    -4    10
[2,]     5    -1

```

```

>
> #-----
> # Multiplication by a scalar
> #-----
>
> c<-matrix(c(2, -1, 3, 0, 4, -2),2,3,byrow=T)
> c
      [,1] [,2] [,3]
[1,]    2  -1    3
[2,]    0   4   -2
>
> d<-2*c
> d
      [,1] [,2] [,3]
[1,]    4  -2    6
[2,]    0   8   -4
>
> #-----
> # Transpose of a matrix
> #-----
>
> ct <- t(c)
> ct
      [,1] [,2]
[1,]    2    0
[2,]   -1    4
[3,]    3   -2
>

```

```

> #-----
> #   Matrix multiplication
> #-----
>
> a<- matrix(c(3, 0, -2, 1, -1, 4), 2,3,byrow=T)
> a
      [,1] [,2] [,3]
[1,]     3     0    -2
[2,]     1    -1     4
>
> b<- matrix(c(1,1,1,2,1,3), 3,2,byrow=T)
> b
      [,1] [,2]
[1,]     1     1
[2,]     1     2
[3,]     1     3
>
> c<-a%*%b
> c
      [,1] [,2]
[1,]     1    -3
[2,]     4    11
>

```

```

> #-----
> # Inner product
> #-----
>
> x<-c(1,7,-6,4)
> y<-c(2,-2,1,5)
> x
[1] 1 7 -6 4
> y
[1] 2 -2 1 5
>
>
> t(x)%*%y
      [,1]
[1,]      2
> x%*%y
      [,1]
[1,]      2
> crossprod(x,y)
      [,1]
[1,]      2
>
> #-----
> # Length of a vector
> #-----
>
> ynorm<-sqrt(crossprod(y,y))
> ynorm
      [,1]
[1,] 5.830952
>
> #-----
> # Number of elements in a vector
> #-----
>
> length(y)
[1] 4
>

```

```

> #-----
> # Elementwise multiplication
> #-----
>
> a<-matrix(c(1,2,3,4),2,2,byrow=T)
> a
      [,1] [,2]
[1,]    1    2
[2,]    3    4
>
> b<-matrix(c(3,-1,0,5),2,2,byrow=T)
> b
      [,1] [,2]
[1,]    3   -1
[2,]    0    5
>
> a*b
      [,1] [,2]
[1,]    3   -2
[2,]    0   20
>

```

```

> # -----
> #   Kronecker Product)
> # -----
>
>   a <- matrix(c(2,4,0,-2,3,-1),ncol=2,byrow=T)
>   a
      [,1] [,2]
[1,]     2     4
[2,]     0    -2
[3,]     3    -1
>
>   b <- matrix(c(5,3,2,1),2,2,byrow=T)
>   b
      [,1] [,2]
[1,]     5     3
[2,]     2     1
>
>   kronecker(a,b)
      [,1] [,2] [,3] [,4]
[1,]    10     6    20    12
[2,]     4     2     8     4
[3,]     0     0   -10    -6
[4,]     0     0    -4    -2
[5,]    15     9    -5    -3
[6,]     6     3    -2    -1
>

```

```

> #-----
> #   What happens when the dimensions
> #   of the matrices or vectors are
> #   not appropriate for the operation
> #-----
>
> a<-matrix(c(1, 1, 1, 2), 2, 2, byrow=T)
> b<-matrix(c(3, 0, -2, 1, -1, 4), 2, 3, byrow=T)
> a
      [,1] [,2]
[1,]    1    1
[2,]    1    2
> b
      [,1] [,2] [,3]
[1,]    3    0   -2
[2,]    1   -1    4
>
> a+b
이하에 에러a + b : 적절한 배열이 아닙니다
>
> b+a
이하에 에러b + a : 적절한 배열이 아닙니다
>
> a%%b
      [,1] [,2] [,3]
[1,]    4   -1    2
[2,]    5   -2    6
>
> b%%a
이하에 에러b %% a : 적절한 인수가 아닙니다
>
> a*b
이하에 에러a * b : 적절한 배열이 아닙니다

```