MATH 423/533 – LINEAR ALGEBRA IN R

Basic linear algebra operations

```
> #Linear Algebra using R
>
> set.seed(302010)
>
> #Set the dimensions
> n<-10
> p<-3
>
> #Generate the values for the X matrix
> #As an example, use rnorm to generate Normal variates.
>
> xvals<-rnorm(n*p)
> (X<-matrix(xvals,nrow=n,ncol=p))
             [,1]        [,2]        [,3]
 [1,]  0.9450004 -0.55071755  0.91317861
 [2,]  0.7190838 -0.03481209  1.27005939
 [3,]  0.3246072 -0.40596192  0.64320042
 [4,]  0.8132462  0.72374771 -0.03207729
 [5,] -2.0519292 -1.14443108  1.34765935
 [6,]  0.8539481  0.90111770 -0.43351170
 [7,]  1.0453535 -0.04407699  0.09338185
 [8,] -0.7995268  0.42617606  1.31887312
 [9,]  0.8444945  0.59342258  0.02013398
[10,] -0.3318908  0.54180037 -0.08288023
>
> #Set the n values for y
>
> y<-rnorm(n)
>
> ##########################################
>
> #Matrix multiplication
>
> b<-c(3,-2,1)
>
> #Result of X b multiplication
> (X%*%b)
             [,1]
 [1,]  4.8496150
 [2,]  3.4969350
 [3,]  2.4289458
 [4,]  0.9601660
 [5,] -2.5192660
 [6,]  0.3260971
 [7,]  3.3175963
 [8,] -1.9320593
 [9,]  1.3667724
[10,] -2.1621534
```

```
> 
> #System Xb = y is over-determined (n equations, p unknowns).
> 
> XtX<-t(X) %*% X
> 
> Xty<-t(X) %*% y
> 
> #Solve the now exactly determined system
> b<-solve(XtX,Xty)
> 
> #Now use solve in a slightly different way
> #Compute the inverse first
> XtXinv<-solve(XtX)
> 
> (b<-XtXinv %*% Xty)
             [,1]
[1,]  0.05723051
[2,] -0.80034473
[3,] -0.10182072
```