Least Squares Computions

Problem 10.6

Contents

Setup

```
clear;
A = [1000 1001; 1001 1002; 1002 1003; 1003 1004; 1004 1005];
b = [2001; 2003; 2005; 2007; 2009];
x_perf = [1; 1];
```

Part a

```
condition = cond(A)
```

```
condition =

    1.4213e+06
```

Part b

```
x_svd = inv(A'*A)*A'*b;
```

Part c

```
[M, N] = size(A);
[Q, R] = qr(A);
invR1 = inv(R(1:N, 1:N));
x_qr = invR1*(Q(:, 1:N)'*b);
```

Part d

```
L = chol(A'*A);
```

```
invA = inv(L) * inv(L');
x_chol = invA*A'*b;
```

Part e

```
x_mldivide = A\b;
```

Part f

```
svd_err = norm(x_perf - x_svd)
qr_err = norm(x_perf - x_qr)
chol_err = norm(x_perf - x_chol)
mldivide_err = norm(x_perf - x_mldivide)
```

```
svd_err =

   1.2228e-04


qr_err =

   3.3871e-11


chol_err =

   1.1098e-04


mldivide_err =

   4.9520e-11
```