Total Least Squares

Problem 10.3

Contents

Setup

```
clear;
A = [2 4 -1; 1 -2 1; 4 0 1; 5 6 -1; 8 -4 2];
y = [1; 2; -1; -2; 5];
```

TLS Solution

```
C = [A y];
R = rank(C);

r = R - 1;
[W, Gamma, Z] = svd(C);
Gamma = Gamma(1:R, 1:R);
W = W(:, 1:R);
Z = Z(:, 1:R);
Xcap = W(:, 1:end-1)*Gamma(1:end-1, 1:end-1)*Z(:, 1:end-1)';
delta = W(:, end)*Gamma(end, end)*Z(:, end)';
```

Part a

```
xtls = (-1.0/(Z(end:end))) * Z(1:end-1:end)
```

```
xtls =

   -8.1399   -1.0000
```

Part b

```
residual_err = norm(delta, 'fro')^2;
deltaA = delta(:, 1:end-1)
deltay = delta(:, end)
```

```
deltaA =
```

```
 -0.0190    0.0377    0.1112
 -0.0561    0.1112    0.3280
 -0.0297    0.0589    0.1736
  0.0074   -0.0147   -0.0433
  0.0226   -0.0448   -0.1322


deltay =

  0.0127
  0.0376
  0.0199
 -0.0050
 -0.0151
```