

Section 7.2 Exercises

1. Use the technique, $(A^T A)x=(A^T b)$. The corresponding augmented matrix is

6	1		8
1	3		0

$x =$
1.4118 \rightarrow 24/17
-0.4706 \rightarrow -8/17

2. Use the technique, $(A^T A)x=(A^T b)$. The corresponding augmented matrix is

27	5		6
5	39		2

$x =$
0.2179 \rightarrow 56/257
0.0233 \rightarrow 6/257

7. The linear system $Ax = b$ has augmented matrix

2	1		1
3	1		2
4	1		3
5	1		2

We now form $(A^T A)x=(A^T b)$. The corresponding augmented matrix is

54	14		30
14	4		8

$x =$
0.4000
0.6000

8. The linear system $Ax = b$ has augmented matrix

3	1		2
4	1		3
5	1		2
6	1		4
7	1		3

We now form $(A^T A)x=(A^T b)$. The corresponding augmented matrix is

135	25		73
25	5		14

$x =$
0.3000
1.3000

11. The linear system $Ax = b$ has augmented matrix

0	0	1.0000		3.2000
0.2500	0.5000	1.0000		1.6000
1.0000	1.0000	1.0000		2.0000
4.0000	2.0000	1.0000		-0.4000
6.2500	2.5000	1.0000		-0.8000
9.0000	3.0000	1.0000		-1.6000
16.0000	4.0000	1.0000		0.3000
25.0000	5.0000	1.0000		2.2000

We now form $(A^T A)x=(A^T b)$.
The corresponding augmented

1018.125	240.75	61.5		41.2
240.75	61.5	18		7.4
61.5	18	8		6.5

matrix is

$$x = \begin{array}{l} 0.57176629517055 \\ -3.13140830800405 \\ 3.46271529888551 \end{array}$$

14. The linear system $Ax = b$ has augmented matrix

$$\begin{array}{ccc|c} 0 & 1.0000 & 1.2000 & \\ 1.0000 & 1.0000 & 2.3000 & \\ 2.0000 & 1.0000 & 3.2000 & \\ 3.0000 & 1.0000 & 3.6000 & \\ 4.0000 & 1.0000 & 3.8000 & \\ 5.0000 & 1.0000 & 5.1000 & \end{array}$$

We now form $(A^T A)x = (A^T b)$. The corresponding augmented matrix is

$$\begin{array}{ccc|c} 55.0000 & 15.0000 & 60.2000 & \\ 15.0000 & 6.0000 & 19.2000 & \end{array}$$

$$x = \begin{array}{l} 0.6971 \\ 1.4571 \end{array}$$

So the least squares line is $y = 0.6971x + 1.4571$.
Next set $x = 9$ to predict the value in 2006; we get 7.731 (millions).