
Solutions

Solutions to Chapter 2 Exercise

- Graph 2.9 contains:
 - 13 vertices
 - 17 edges
 - 5 multiple edges
 - 2 loops
 - 3 vertices adjacent to vertex a
 - 8 vertices connected to vertex a
- The graph induced by...
 - vertices $\{a, b, c, d, e\}$ should contain vertices $\{a, b, c, d, e\}$ and edges $\{(a, b), (a, c), (a, d), (c, c), (b, e)\}$.
 - edges $\{x, y, z\}$ should contain vertices $\{g, j, k, l\}$ and edges $\{(g, j), (g, k), (j, l)\}$.
- Graphs Y and Z are isomorphic. One possible isomorphism is given in Table 13.2. Graphs Y and Z are not automorphic.
- A planar clique of size...
 - 4 can exist.
 - 5 cannot exist.

TABLE 13.2: One possible isomorphism of graphs Y and Z .

$V(A)$	$V(B)$
a	d
b	b
c	f
d	a
e	e
f	c

- (c) 6 cannot exist.
- 5. Given an undirected tree...
 - (a) it is possible to draw a directed tree with the same number of vertices and edges.
 - (b) it is not possible to draw a new undirected tree with the same number of vertices but a different number of edges.
 - (c) it is not possible to add an edge to the tree without creating a cycle.
 - (d) it is not possible to remove an edge from the tree without disconnecting at least one vertex.

Solutions to Chapter 3 Exercises

```
1.  1 > library(stats)
    2 > summary(m.age)
    3   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
    4  15.70  17.20   20.60   21.51  24.90   30.40
    5 > sd(m.age)
    6 [1] 4.83385
    7 > var(m.age)
    8 [1] 23.36610
```

2. Figure 13.20 displays the solution.

- 3. (a) $4 + y$
(b) $y - x$
(c) $sum(y)$
(d) $x * y$
(e) $y[1 : 5]$
- 4. (a) $seq(1, 10, by = 2)$
(b) $seq(2, 10, by = 2)$
(c) $seq(10, 1, by = -1)$
(d) $seq(1, 10, by = 2)^3$
- 5. (a) $\mathbf{A} + \mathbf{B} = \begin{pmatrix} 9 & 11 \\ 10 & 7 \end{pmatrix}$
(b) $\mathbf{A} + 3*\mathbf{B} = \begin{pmatrix} 23 & 23 \\ 14 & 13 \end{pmatrix}$

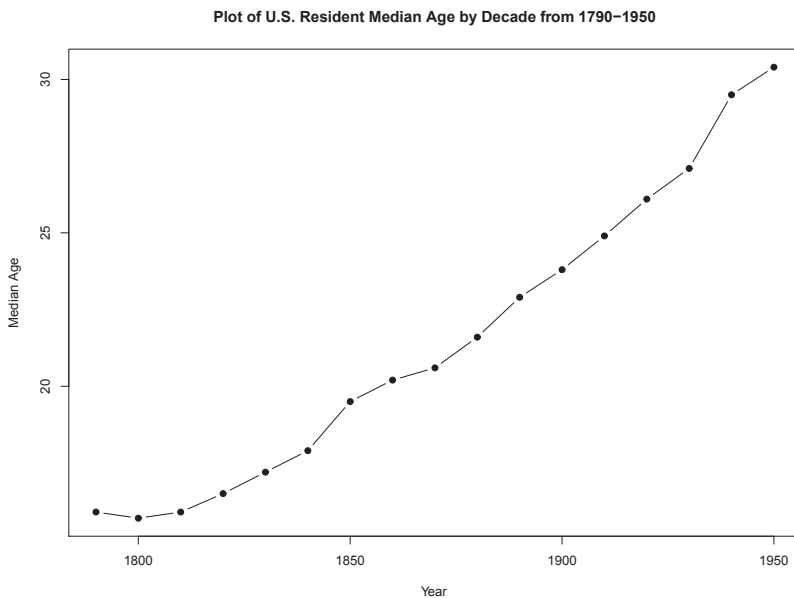


FIGURE 13.20: The output of the plot command `plot(year, m.age, type="b", col="black", xlab="Year", ylab="Median Age", main="Plot of U.S. Resident Median Age by Decade from 1790-1950", font.main=2, font.lab=1, pch=19)`

(c) $\det(\mathbf{A}) = -32$

(d) $\mathbf{A} \%*\% \mathbf{B} = \begin{pmatrix} 24 & 27 \\ 64 & 60 \end{pmatrix}$

(e) $t(\mathbf{B}) = \begin{pmatrix} 7 & 2 \\ 6 & 3 \end{pmatrix}$

6. `1 > cube = function(x){x^3}`

7. `1 > randomNumbers(n=100,min=1,max=25,col=10)`

```
2      V1 V2 V3 V4 V5 V6 V7 V8 V9 V10
3 [1,]  3 20  9 22 17  2 23 12  9  13
4 [2,]  3  4 21  8 25 15 24 10  7  4
5 [3,] 18 23 25  4 10 22  1 15  3  2
6 [4,]  9  3 22  7 12  9 15 21 14 24
7 [5,] 11  3 16 20 13  2  9  8 25  4
8 [6,] 19  3 13  9  6 20  8 14 22  1
9 [7,] 25  6  9 11 11 21 17 15 23  6
```

₁₀	[8,]	9	22	21	19	5	13	16	5	1	6
₁₁	[9,]	4	11	7	11	24	20	3	3	23	20
₁₂	[10,]	15	9	5	16	4	13	11	16	19	14

Solutions to Chapter 4 Exercises

1 1a **A** is symmetric, **B** is not.

$$\begin{bmatrix} & 1 \\ & \end{bmatrix}$$