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# Solutions

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## 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)  $\mathbf{A} + 3*\mathbf{B} = \begin{pmatrix} 23 & 23 \\ 14 & 13 \end{pmatrix}$