Answer Key

1. a. Is it Onto? yes, every domain element has an input
   Is it One-to-one? yes, every domain element has max 1 input

   b. Is it Onto? yes, every domain element has an input
   Is it One-to-one? yes, every domain element has max 1 input

   c. Is it Onto? no, the bottom domain element doesn't have an input
   Is it One-to-one? no, one element has 2 inputs

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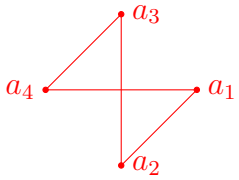
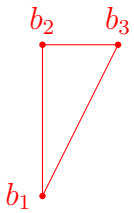
2. Multiple solutions, but here are some examples:

   a. Example:



   b. Example:



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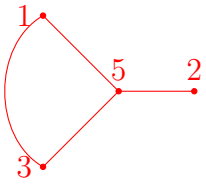
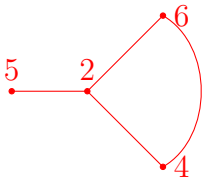
3. a. Write out all edges for both graphs.
   G: {2, 5} { 2, 3 } { 3, 4 } { 4, 5 } { 2, 5 } { 5, 6 }
   H: {d, c} { y, x } { x, w } { w, v } { y, v } { v, u }

   b. For each edge from G, write out what edge in H corresponds to it. Example: {2,5} → {d, c}

   Let's split up G into two subgraphs to see it more clearly...





$\{1,3\} \to \{b,a\}$ $\{1,5\} \to \{b,c\}$ $\{2,4\} \to \{d,e\}$
$\{2,5\} \to \{d,c\}$ $\{2,6\} \to \{d,f\}$ $\{3,5\} \to \{a,c\}$
$\{4,6\} \to \{e,f\}$

4. a. Finish the adjacency matrix:

	a	b	c	d	e
a	0	1	0	0	1
b	1	0	1	0	0
c	0	1	0	1	1
d	0	0	1	0	1
e	1	0	1	1	0

b. Fill out the degrees of each:

a	b	c	d	e
2	2	3	2	3

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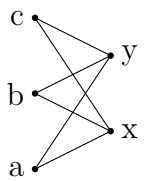
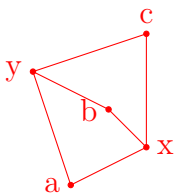
5. 

Example: 

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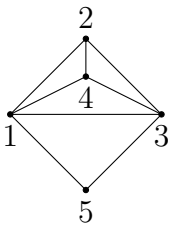
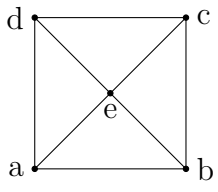
6. a. 

1, 2, 4, 1 1, 3, 5, 1 2, 3, 4, 2
1, 3, 4, 1 1, 2, 3, 5, 1 (unbounded).

b. 

a, b, e, a a, e, d, a d, e, c, d b, c, e, b
a, b, c, d, a (unbounded)