

For the next five questions, your response will be one of the following:

- A. Partial order but not a total order.
- B. Partial order and a total order.
- C. Strict order but not a total order.
- D. Strict order and a total order.
- E. Neither a partial order nor a strict order.

Select one of the five choices above that describes each of the following relations.

- C** 1. The domain is  $\mathbb{Z} \times \mathbb{Z}$ .  $(a, b)$  is related to  $(c, d)$  if  $a < c$  and  $b < d$ .
- B** 2. The domain is the set of students on a wait list to get into a course. Student  $x$  is related to student  $y$  if student  $x$  is at least as high on the list as  $y$  (i.e.,  $x$  is not lower on the list than  $y$ ).
- A** 3. The domain is the set of positive integers.  $x$  is related to  $y$  if there is a positive integer  $n$  such that  $y = x \cdot n$ .
- C** 4. The domain is the set of all positive numbers.  $x$  is related to  $y$  if  $\lfloor x/2 \rfloor < \lfloor y/2 \rfloor$ .
- E** 5. The domain is the set of all positive numbers.  $x$  is related to  $y$  if  $\lfloor x/2 \rfloor \leq \lfloor y/2 \rfloor$ .

The matrix below is an adjacency matrix for a graph  $G$ . The vertices are  $\{1, 2, 3, 4\}$ . The rows and columns of the matrix are numbered 1 through 4.

$$\begin{bmatrix} 0 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 \end{bmatrix}$$

6. What is the set of edges going into vertex 2 in  $G$  (i.e. the edges whose head is vertex 2 in  $G$ )?

- A.  $\{(2, 2), (3, 2)\}$
- C**  $\{(1, 2), (2, 2), (3, 2)\}$
- B.  $\{(2, 2), (2, 3)\}$
- D.  $\{(1, 2), (2, 2), (3, 2), (2, 3)\}$

7. What is row 2 of the adjacency matrix for  $G^2$ ?

- A.  $[0 \ 1 \ 1 \ 0]$
- B**  $[1 \ 1 \ 1 \ 0]$
- C.  $[0 \ 1 \ 1 \ 1]$
- D.  $[0 \ 1 \ 0 \ 1]$

8. What is the set of edges going out of vertex 2 in  $G^2$  (i.e. the edges whose tail is vertex 2 in  $G^2$ )?

- A.  $\{(1, 2), (2, 2), (3, 2)\}$
- B**  $\{(2, 1), (2, 2), (2, 3)\}$
- C.  $\{(2, 2), (2, 3)\}$
- D.  $\{(2, 2), (3, 2)\}$

