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(7 points) Can we create a set C such that C is a partition of $\mathbb{R}$ but $|C|$ is finite? Give a specific set C that works or briefly explain why it's impossible.

(8 points) Check the (single) box that best characterizes each item.

$\mathbb{P}(A) \cap \mathbb{P}(B) = \mathbb{P}(A \cap B)$ always ☐ sometimes ☐ never ☐

If $n \geq k \geq 0$, then $\binom{n}{k} = \binom{n}{n-k}$ true ☐ true for some n and k ☐ false ☐

$\binom{n}{0}$ -1 ☐ 0 ☐ 1 ☐ 2 ☐ n ☐ undefined ☐

$\mathbb{P}(A) \cap \mathbb{P}(B) = \emptyset$ always ☐ sometimes ☐ never ☐

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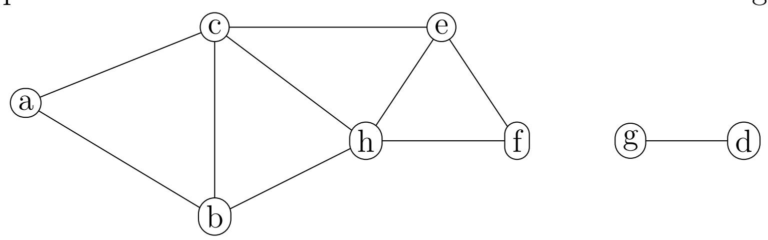
Graph G is shown below with set of nodes V and set of edges E.



Let $f : V \to \mathbb{P}(V)$ such that $f(n) = \{v \in V \mid \text{ there is a cycle containing } n \text{ and } v\}$. Let $T = \{f(n) \mid n \in V\}$.

(6 points) Fill in the following values:

$|E| =$

$f(b) =$

$f(h) =$

(7 points) Is T a partition of V? For each of the three conditions required to be a partition, explain why T does or doesn't satisfy that condition.

(2 points) Check the (single) box that best characterizes each item.

$\mathbb{P}(A) \cup \mathbb{P}(B) = \mathbb{P}(A \cup B)$ always ☐ sometimes ☐ never ☐

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Let $f : \mathbb{R}^2 \to \mathbb{P}(\mathbb{R}^2)$ be defined by $f(x, y) = \{(p, q) \in \mathbb{R}^2 \mid x^2 + y^2 = p^2 + q^2\}$
Let $T = \{f(x, y) \mid (x, y) \in \mathbb{R}^2\}$.

(6 points) Answer the following questions:

$f(0, 0) =$

Describe (at a high level) the elements of $f(0, 36)$:

The cardinality of (aka the number of elements in) T is:

(7 points) Is T a partition of $\mathbb{R}^2$? For each of the conditions required to be a partition, briefly explain why T does or doesn't satisfy that condition.

(2 points) Check the (single) box that best characterizes each item.

Let A be a non-empty set,
$\{A\}$ is a partition of A. always ☐ sometimes ☐ never ☐

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(7 points) Suppose that A and B are disjoint sets, C_A is a partition of A and C_B is a partition of B. Is $C_A \cup C_B$ a partition of $A \cup B$? Briefly justify your answer.

(8 points) Check the (single) box that best characterizes each item.

$|\mathbb{P}(\mathbb{P}(\emptyset))|$ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ undefined ☐

If $f : \mathbb{P}(\mathbb{Q}) \to \mathbb{N}$ then $f(3)$ is a rational ☐ a power set of rationals ☐ a set of rationals ☐ undefined ☐

$|\{\emptyset\}|$ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ undefined ☐

$\mathbb{P}(A \cup B) = \mathbb{P}(A) \cup \mathbb{P}(B)$ always ☐ sometimes ☐ never ☐

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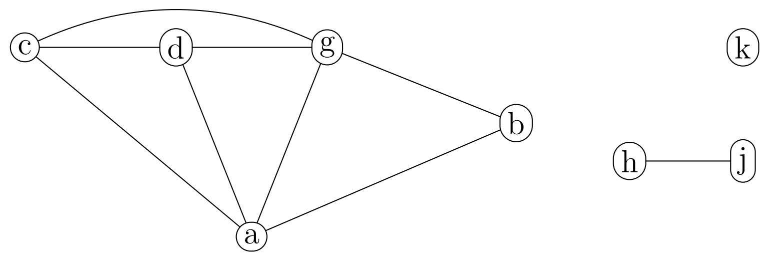
Graph G is at right.
V is the set of nodes.
E is the set of edges.
ab (or ba) is the edge between a and b.



Let $f : V \to \mathbb{P}(V)$ be defined by $f(n) = \{v \in V \mid \text{there is a path from n to v}\}$. And let $T = \{f(n) \mid n \in V\}$.

6 points) Fill in the following values:

$f(k) =$

$f(d) =$

$T =$

(7 points) Is T a partition of V? For each of the conditions required to be a partition, briefly explain why T does or doesn't satisfy that condition.

(2 points) Check the (single) box that best characterizes each item.

$\binom{n}{1}$ -1 ☐ 0 ☐ 1 ☐ 2 ☐ n ☐ undefined ☐

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(7 points) Can a set A be a partition of the empty set? Briefly justify your answer.

(8 points) Check the (single) box that best characterizes each item.

Pascal's identity states that $\binom{n+1}{k}$ is equal to $\binom{n}{k} + \binom{n}{k+1}$ ☐ $\binom{n}{k} + \binom{n-1}{k}$ ☐ $\binom{n}{k} + \binom{n}{k-1}$ ☐

$\mathbb{P}(A \cap B) \subseteq \mathbb{P}(A \cup B)$ always ☐ sometimes ☐ never ☐

If $f : \mathbb{R} \to \mathbb{P}(\mathbb{Z})$ then $f(17)$ is an integer ☐ a set of integers ☐ one or more integers ☐ a power set ☐

A partition of a set A contains A always ☐ sometimes ☐ never ☐