My Courses / My courses / Algorithms and Data Structures, MSc (Spring 2023) / Mandatory Activities / Graph terminology

Information

These questions are mostly about terminology. Should be cognitively easy; you may need to consult external sources.

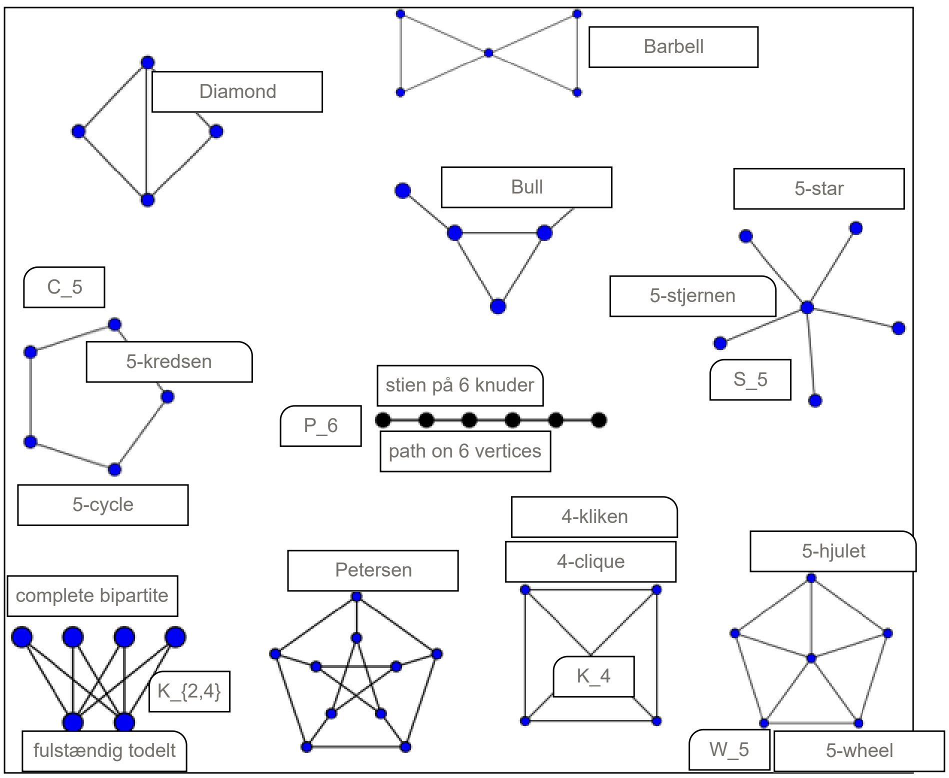
Question 1

Answer saved

Marked out of 1.00

Many undirected graphs have well-established (and sometimes quite meaningful) names and notation. Most of these should be obvious and maybe even cute, consult external sources for the rest.

Moodle’s maths support is sketchy, `P_5` means P_5.

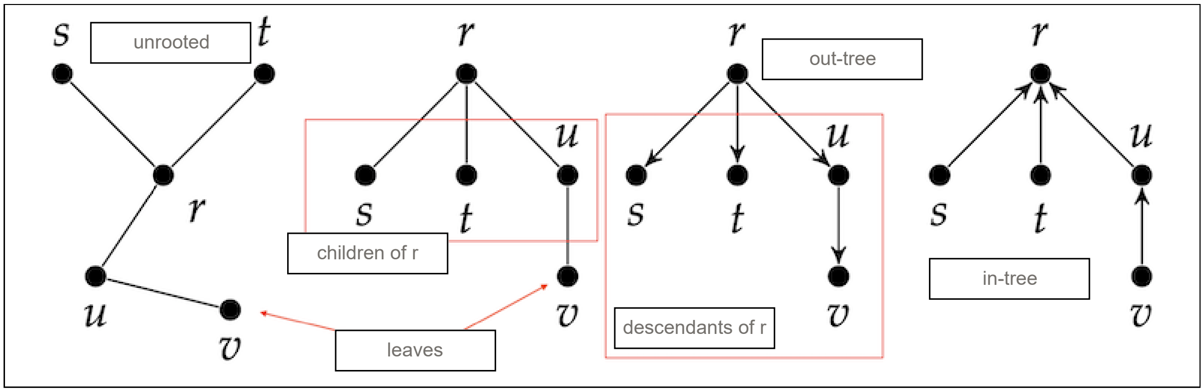


Question 2

Answer saved

Marked out of 1.00

“Tree” refers to several closely related things. Here are some words for increased precision.



Question 3

Answer saved

Marked out of 1.00

Consider again the leftmost of the trees from the previous question.

The second drawing shows this tree *rooted at* r . In *this* question, we will root the tree at s .

Select the true statements.

- [x] a. There are 2 leaves
- [ ] b. The height is 2 (edges).
- [ ] c. r is the root
- [ ] d. s is the parent of r

Question 4

Incomplete answer

Marked out of 1.00

(dansk version næste spørgsmål) Graph terminology is inconsistent, with many different words meaning the same thing, and some words meaning different things. Note that the word, *graph*, itself means completely different things in other branches of mathematics.

In classical graph theory, graph are still viewed primarily as drawings (hence the name, graph): Thus, the fundamental units are [node] s, and the relation between two of these is called a [line] . This terminology remains widely used in mathematics.

Most modern texts on graph theory and computer science take their terminology from solid geometry. (For some geometric intuition, look at the cube graph Q_3 on the Wikipedia page for **Cube**.) Thus, the units are called [vertex] , and the relation is an [edge] .

In network theory, the unit is called [point] . The relation is often called [link] .

These terms are freely mixed. For instance, the endpoints of an edge are vertices, a cut vertex is an articulation point, the vertices in a tree are often called nodes, etc. Some graph theory texts adopt separate terminology for directed graphs, using *nodes* (and the letter N) for *vertices* and *arcs* (and the letter A) for directed edges.) In data structures, *node* is used almost exclusively; the reference can be called [pointer] instead of *link*.

Please put an answer in each box.

Question 5

Not yet answered

Marked out of 0.01

(the previous question is the English version of this) Grafterminologi er inkonsistent og forvirrende. Læg mærke til, at ordet *graf* selv allerede betyder mindst to helt forskellige ting i dele af matematikken.

Klassisk grafteori tager udgangspunkt i grafens tegning (heraf navnet *graf*). Derfor består en graf af [knude] er, der er forbundet med [linje] r. De fleste moderne fremstillinger bruger dog terminologi hentet fra geometrien. Her er enheden [punkt] t, og relation er en [kant] . I netværksteori kaldes enheden »[peger]«. På dansk blandes denne terminologi på tværs af domæner, og det er mest udbredt at tale om *knuder* og *kanter* . Der skelnes mellem [rettede] (symmetriske) og [urettede] (usymmetriske) kanter. Nogle traditioner foretrækker »bue« for rettet kant.

En rettet graf er [orienteret] , hvis den er ensrettet i følgende forstand: For hvert par af knuder u, v gælder, at hvis der er en kant fra u til v, så er der ingen kant fra v til u.

Disse termer blandes frit og hensynsløst. En kant har fx knuder som endepunkter, og snitknuden er et artikulationspunkt. I datastrukturer bruges næsten udelukkende *knude*; hægtningen fra en knude til en anden kaldes sommetider en [hjørne] .

Question 6

Not yet answered

Marked out of 1.00

Consider the undirected graph with vertex set $\{1, 2, 3\}$ and the two edges $1 - 2$ and $2 - 3$.

Select the true statements.

- [x] a. 1 and 3 are adjacent (*hosliggende*)
- [ ] b. 1 and 3 are connected (*sammenhængende*)
- [x] c. 1 and 2 are connected (*sammenhængende*)
- [x] d. 1 and 2 are adjacent (*hosliggende*)
- [x] e. The graph is connected

Question 7

Not yet answered

Marked out of 1.00

There are at least three schools for graph notation.

In what we can call the "tuple tradition", a graph is a tuple $G = (V, E)$, where V is a set and E is either a set of tuples (for directed graphs) or a family of subsets (for undirected graphs). The Wikipedia page Graph theory uses this tradition.

In the tradition solidified by West, (see discussion), a graph G is the fundamental object and the vertices and edges are denoted $V(G)$ and $E(G)$.

In both traditions, n and m are often used for the number of vertices and edges.

Sedgewick and Wayne eschew mathematical notation and have no standard notation for either of these things. Instead, they use V and E to denote the *number* of vertices and edges, respectively.

This can be confusing to navigate: Depending on which reference you consult, V is either an integer, a set, or a function. Most references aim at being at least *internally* consistent.

Select the statements or expressions that *make sense* under at least one of these conventions. (They don't have to be always true. "$x^2 \leq y$" makes sense but can be false. "$3/\sqrt{=}^2$ makes no sense.)

The other statements are nonsense in any tradition.

- [ ] a. $V = E$
- [x] b. $n = |V(G)|$
- [x] c. $V \in E$
- [ ] d. $\{u, v\} \in E$ for $u, v \in V$
- [ ] e. $(u, v) \in E(G)$ for $u, v \in V$
- [x] f. $\{u, v\} \subseteq E$ for $u, v \in V$
- [ ] g. $V(G) \in \{u, v\}$ for $u, v \in V(G)$
- [ ] h. $V \sim E$
- [ ] i. m is $O(n^2)$
- [x] j. $v \in V$
- [x] k. $\{u, v\} \subseteq V$