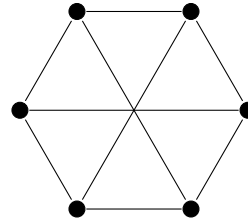


**Exercise 1**

Build a graph that has treewidth equal to 4, but is 3-degenerate. Is it chordal?

**Exercise 2**



What is the treewidth of the following graph? Justify your answer.

**Exercise 3**

Is it true that a graph is outerplanar if and only if it is planar and with treewidth at most 2? Justify your answer.

**Exercise 4**

If  $G$  is a graph and  $H$  a subgraph of  $G$ , prove that the treewidth of  $H$  is at most that of  $G$ .

**Exercise 5**

If  $G$  is a graph and  $H$  is obtained from  $G$  by deleting a single edge, is it possible that the treewidth of  $H$  and that of  $G$  differ by exactly 2? What about if you delete two edges instead of one? Justify your answers (in each case, either build such a pair of graphs  $(G, H)$  or prove it is impossible).

**Exercise 6**

Let  $k$  be a fixed integer. Give a polynomial algorithm to 3-color graphs with treewidth at most  $k$  (you can assume that you are given a tree decomposition of the input graph).