Computational topology
## Lab work 10

1. Two different monotonic functions are given on the simplicial complex X:

$$f = \{(A,1), (B,0), (C,2), (AB,3), (AC,4), (BC,5), (ABC,6)\},$$
$$g = \{(A,0), (B,1), (C,2), (AB,5), (AC,4), (BC,3), (ABC,6)\}.$$

   (a) Create the corresponding filtrations of subcomplexes.

   (b) Draw the barcode diagrams and the persistence diagrams in dimensions 0 and 1.

   (c) Construct the boundary matrices D_f and D_g from the two filtrations.

   (d) Use the matrix reduction to compute persistence.
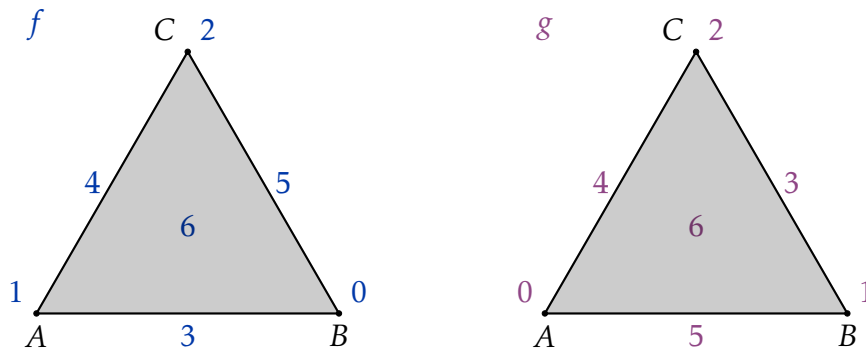

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for j = 1 to m:
    while there exists j₀ < j with low(j₀) = low(j):
        D[:, j] = D[:, j] − D[low(j), j]/D[low(j), j₀] * D[:, j₀]
```

2. Let K be the simplicial complex drawn below.
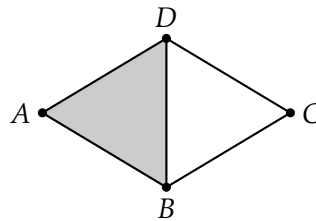
   A filtration on K is given as

   - $K_1 = \{A, C\}$,
   - $K_2 = K_1 \cup \{B, D, BD\}$,
   - $K_3 = K_2 \cup \{AD, BC\}$,
   - $K_4 = K_3 \cup \{CD\}$,
   - $K_5 = K_4 \cup \{AB\}$,
   - $K_6 = K_5 \cup \{ABD\}$.

   (a) Draw the barcode diagrams and the persistence diagrams in dimensions 0 and 1.

   (b) Construct the boundary matrices D of this filtration.

   (c) Column–reduce D to compute persistence.