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ToPD@k_MD := ToPD@k = Block[ {a = Abs /@ k, n = Length@k, o, r}, o = Ordering@a;
  Do[ If[ PlanarGraphQ@
    Graph[ Join @@ Table[ Array[ {v, # - 1} ↔ {v, #} &, 3] ∪ { {v, 0} ↔ {v, 3} } ∪ Join @@
      ( { {v, #[[1]]} ↔ {#[[2]], #[[1]] + (1 - c[[v]] c[[#[[2]]]) / 2}, {v, 3 - #[[1]]} ↔ {#[[2]], #[[1]] +
        (1 + c[[v]] c[[#[[2]]]) / 2} } & /@ ( {#, o[[Mod[v - # / 2, n, 1]]]} & /@ {0, 2} ) ),
      {v, n} ]], (*The crossing assignment c is a valid assignment.*) r = c;
  Break[]], {c, Tuples[{1, -1}, n]}];
PD @@ (X_### & @@@ Array[ {2 # - 1, 2 a[[#], 2 #, Mod[2 a[[#]] + 1, 2 n, 1]} [
  If[Sign@k[[#]] == 1, ;;, {2, 3, 4, 1}]] [If[r[[#]] == 1, ;;, {1, 4, 3, 2}]] &, n] )];

```