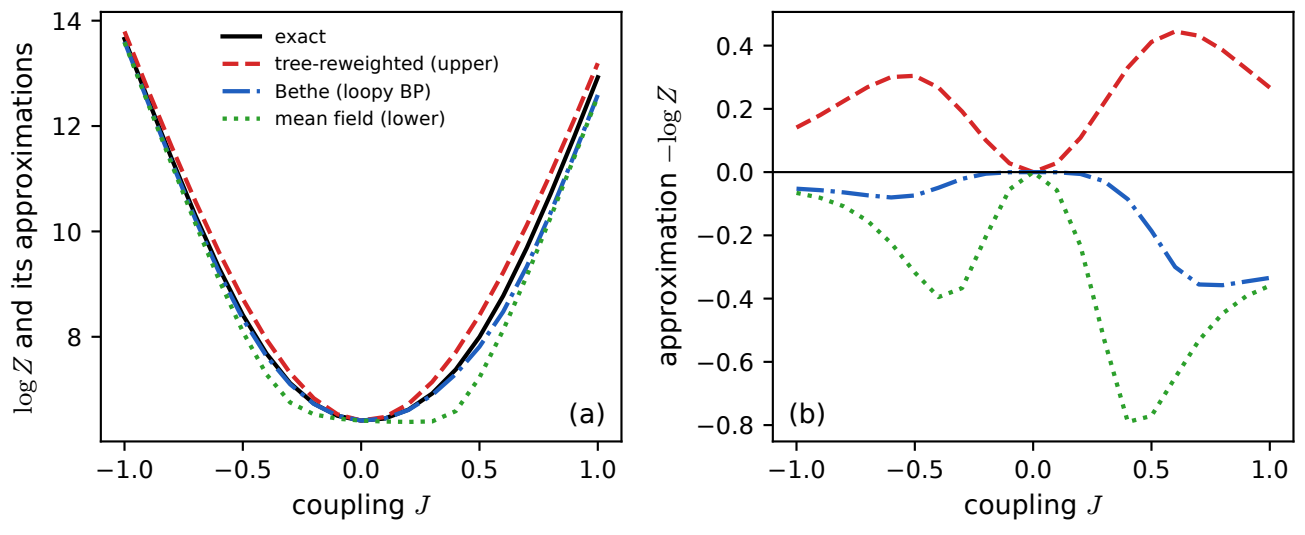

exact
tree-reweighted (upper)
Bethe (loopy BP)
mean field (lower)
log Z and its approximations
14
12
10
8
−1.0
−0.5
0.0
0.5
1.0
coupling J
(a)
approximation −log Z
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
coupling J
(b)