Exercise 3.18 [Boyd & Vandenberghe, 2004]

Adapt the proof of concavity of the log-determinant function in §3.1.5 to show the following.

(a) $f(\mathbf{X}) = \mathbf{tr}(X^{-1})$ is convex on $\mathbf{dom} f = \mathbf{S}_{++}^n$.

(b) $f(\mathbf{X}) = (\det X)^{1/n}$ is concave on $\mathbf{dom} f = \mathbf{S}_{++}^n$.