

## WEEKLY PARTICIPATION 5

Recall that we setup the problem of learning a linear separator  $y = \text{sign}(\langle \mathbf{w}, \mathbf{x} \rangle)$  for binary classification as follows (SVM):

$$\mathbf{w}_* = \arg \min_{\mathbf{w}} \frac{1}{n} \sum_{i=1}^n \ell(y^{(i)} \langle \mathbf{w}, \mathbf{x}^{(i)} \rangle) + \frac{\lambda}{2} \|\mathbf{w}\|_2^2,$$

where  $\ell$  could be any of the following:

- (A)  $\phi(t) = (1 - t)_+$
- (B)  $\phi(t) = \log(1 + \exp(-t))$
- (C)  $\phi(t) = \exp(-t)$
- (D)  $\phi(t) = 1 - \tanh(t)$

Which of these do *not* give a convex optimization problem? Answer by listing the letters corresponding to those choices.