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CS156a Set 5

1. C

$$E_{in} = (0.1)^2 * \left(1 - \frac{9}{100}\right) = 0.0091$$
$$E_{in} = (0.1)^2 * \left(1 - \frac{9}{25}\right) = 0.0064$$

Therefore N = 100 is the lowest N for which $E_{in} > 0.008$, so the answer is C.

2. D

On the boundary line, we have the function:

$$0 = w_0 + w_1 x_1^2 + w_2 x_2^2$$
$$w_0 = -w_1 x_1^2 - w_2 x_2^2$$

And in order to get an upright hyperbola as displayed, the boundary line must have a function similar to $a = bx_1^2 - cx_1^2$ where $a, b, c > 0$. Therefore we must have that $w_1 < 0$ and $w_2 > 0$. Therefore the answer is D.

3. C

Because we're using a 4th order polynomial transform, the resulting weight vector is of dimension 14. Therefore according to the formula $d_{VC} \leq d\tilde{} + 1$, we know that $d_{VC} \leq 15$ so therefore the answer is C.

4. E

$$\frac{\partial E}{\partial u} = \frac{\partial}{\partial u}(ue^v - 2ve^{-u}) * 2(ue^v - 2ve^{-u})$$
$$= 2 * (ue^v - 2ve^{-u})(e^v + 2ve^{-u})$$

Therefore the answer is E.

5. D

Justification in attached Jupyter notebook

6. E

Justification in attached Jupyter notebook

7. A

Justification in attached Jupyter notebook

8. D

Justification in attached Jupyter notebook

9. A

Justification in attached Jupyter notebook

10. E

If a point is classified correctly, according to the PLA the corresponding error should be 0. A, B, C, and D do not match this. Also, the amount of error is directly proportional to the distance from 0 obtained from taking $w^T x_n$, which is how the PLA works. Therefore the answer is E.