Jacob Snyder

CS156a Set 7

1. D
   Justified in Jupyter Notebook

2. E
   Justified in Jupyter Notebook

3. D
   Justified in Jupyter Notebook

4. D
   Justified in Jupyter Notebook

5. B
   Justified in Jupyter Notebook

6. D
   Justified in Jupyter Notebook

7. C
   We will consider all possible cases for each model and determine the error for each one in order to calculate average squared error.

   Constant model
   Left out $(-1,0)$: model $= 0.5$, error $= (0.5)^2 = 0.25$
   Left out $(1,0)$: model $= 0.5$, error $= (0.5)^2 = 0.25$
   Left out $(\rho, 1)$: model $= 0$, error $= 1^2 = 1$
   Average error $= \frac{(0.25+0.25+1)}{3} = 0.5$

   Linear model
   Left out $(-1,0)$: model $= -\left(\frac{1}{1-\rho}\right)x + 1 + \left(\frac{1}{1-\rho}\right)$, error $= \left(\frac{2}{1-\rho}\right)^2$
   Left out $(1,0)$: model $= \left(\frac{1}{\rho+1}\right)x + (\frac{1}{\rho+1})$, error $= \left(\frac{2}{\rho+1}\right)^2$
   Left out $(\rho, 1)$: model $= 0$, error $= 1^2 = 1$
   Average error $= \frac{\left(\frac{2}{1-\rho}\right)^2+\left(\frac{2}{\rho+1}\right)^2+1}{3}$

   Now we have $0.5 = \frac{\left(\frac{2}{1-\rho}\right)^2+\left(\frac{2}{\rho+1}\right)^2+1}{3}$

   $$\rightarrow \frac{1}{16} = \frac{1}{\rho^2 - 2\rho + 1} + \frac{1}{\rho^2 + 2\rho + 1}$$

   $$\rightarrow \frac{(\rho^2 - 2\rho + 1) * (\rho^2 + 2\rho + 1)}{16} = (\rho^2 - 2\rho + 1) + (\rho^2 + 2\rho + 1)$$

   This is a quadratic; solving for ρ^2 yields $\rho^2 = 9 \pm 4\sqrt{6} \rightarrow \rho = \sqrt{9 \pm 4\sqrt{6}}$. Taking the real solution, we have $\rho = 9 \pm 4\sqrt{6}$, so the answer is C.

8. C

Justified in Jupyter notebook

9. D
   Justified in Jupyter notebook

10. B
    Justified in Jupyter notebook