

# Q27-WilliamKennedy-300015367

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Consider two curves,  $\hat{g}_1$  and  $\hat{g}_2$

1. As  $\lambda \rightarrow \infty$  will  $\hat{g}_1$  or  $\hat{g}_2$  have a smaller training RSS?

Since the the penalty term is a measure of the roughness of, and  $\hat{g}_2$  has a higher order derivative in the penalty term it will be less smooth as  $\lambda \rightarrow \infty$ , so it should have a smaller RSS since it will be more flexible to the training data.

2. As  $\lambda \rightarrow \infty$  will  $\hat{g}_1$  or  $\hat{g}_2$  have a smaller test RSS?

It would depend on the underlying data, but as  $\lambda \rightarrow \infty$  as long as  $\hat{g}_2$  does not overfit the training data it should have the smaller test RSS. Otherwise, if the data is smoother than  $\hat{g}_1$  should have the smaller test RSS.

3. For  $\lambda = 0$ , will  $\hat{g}_1$  or  $\hat{g}_2$  have the smaller training and test RSS?

They will have the same training RSS and test RSS given that the penalty will be 0 and have no effect. Causing  $g_\lambda$  to be jumpy and interpolate the training observations.