

Name: _____

1. (10 points) Derive the value of $\hat{x}(n+2)$ if I apply first differencing to a data set $x(t) = a + bt$, $t = 1, \dots, n$, and then do undifferencing as implemented by the EXTEND command.
2. (10 points) Solve the difference equation $z(t) - 4z(t-1) + 4z(t-2)$ for $t \geq 3$ and $z(1) = 2$, $z(2) = 3$. What happens to $z(t)$ as $t \rightarrow \infty$? Be sure to justify your answer.
3. (10 points) Suppose I measure four variables Y, Z, X_1, X_2 on n individuals. How do we calculate the partial correlation coefficient $r_{YZ|X_1X_2}$ of Y and Z given X_1 and X_2 ?
4. (10 points) Draw rough sketches of the sample correlogram (be sure to label the axes!) for each of the following types of data sets:
 - a. A series with a strong linear trend.
 - b. A series with a strong cyclic appearance where the cycle length is 10.
 - c. A random walk series.
 - d. A white noise series.
5. (10 points) What is $\hat{\rho}(v)$ for $v = 1, \dots, 99$ for a data set of 100 points consisting of $x(1) = 100$ and then $x(2) = \dots = x(100) = 0$?
6. (10 points) What are y , X , β , and ϵ in the matrix form $y = X\beta + \epsilon$ for the regression model

$$x(t) = a + bt + \epsilon(t), \quad t = 1, \dots, n.$$
7. (10 points) Let $x(t) = \cos(2\pi(t-1)/20)$ and $y(t) = \cos(2\pi(t-1)/10)$ for $t = 1, \dots, 100$. Draw a rough sketch of the data set $z(t) = x(t) + y(t)$ and one for its periodogram.
8. (10 points) Let $x(1), \dots, x(n)$ be a data set and $y(t)$ be the result of applying a moving average smoother (having $2K+1$ terms) to x . If the x 's must be between -2 and 2 , what is the largest value that $y(t) - y(t-1)$ can be? What happens to this maximum value as K increases?

9. (20 points) On the next page are plots of the log of ten spectral densities. On the page after that are plots of ten time series data sets, each having 100 points. Please fill in the following table:

Series	Spectral Density
A	
B	
C	
D	
E	
F	
G	
H	
I	
J	