MATH 5075 R Project 1

Your Name Here

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Remember: I expect to see commentary either in the text, in the code with comments created using `#`*, or (preferably) both!* ***Failing to do so may result in lost points!***

Because randomization is used in this assignment, I set the seed here, in addition to beginning each code block. ***Do not change the seed!***

```
set.seed(6222016)
```

Problem 1

1. *Simulate 150 observations from the following process using the functions* `rnorm()` *and* `filter()`*:*

$$x_t = 0.5x_{t-1} - 0.4x_{t-2} + w_t$$

($w_t \sim N(0,1)$) Discard the first 50 observations; this represents the "burn-in" period.

```
# Your code here
```

2. *Figure out how to use the function* `lm()` *to find the OLS estimate for the parameters in the models:*

$$x_t = \mu + \phi_1 x_{t-1} + w_t$$
$$x_t = \mu + \phi_1 x_{t-1} + \phi_2 x_{t-2} + w_t$$
$$x_t = \mu + \phi_1 x_{t-1} + \phi_2 x_{t-2} + \phi_3 x_{t-3} + w_t$$

using the data obtained in part 1. Report the estimated parameters and their significance levels, the R^2 value, and the F statistic with the associated p-value assessing the fit of the model. Which model appears to provide the best fit? Plot the residuals for each model. Do the residuals appear to be a white noise process? (Hint: consider making a data frame where the lags are the varianbles upon which you regress.)

```
# Your code here
```

Problem 2

The data set `gtemp` *(**astsa**) contains data on global temperatures. This is an R* `ts` *object.*

1. *What span of time is covered by the data in* `gtemp`*? What is the data's frequency (is it semiannual, annual, biannual, monthly, etc.)?*

```
# Your code here
```

2. *Plot the data in* `gtemp`*. Is this a stationary process?*

```
# Your code here
```

3. *Use* `diff()` *to find the first difference of the data; this represents change in temperature. Plot the result. Does this appear to be a stationary process?*

```
# Your code here
```

4. *Use the function* `lm()` *to fit the following model on the first differences of* `gtemp`*:*

$$y_t = \mu + \phi_1 y_{t-1} + \phi_2 y_{t-2} + \phi_3 y_{t-3} + w_t$$

```
# Your code here
```