

WU #21 - Polynomials & Step Functions

Math 158 - Jo Hardin

Thursday 4/21/2022

Name: _____

Names of people you worked with: _____

Consider the following data (from NOAA) on wind temperature at noon as a function of the day of the year from a buoy off the coast of Santa Monica.

Step Functions Directly on the plot below, draw the estimated linear model.

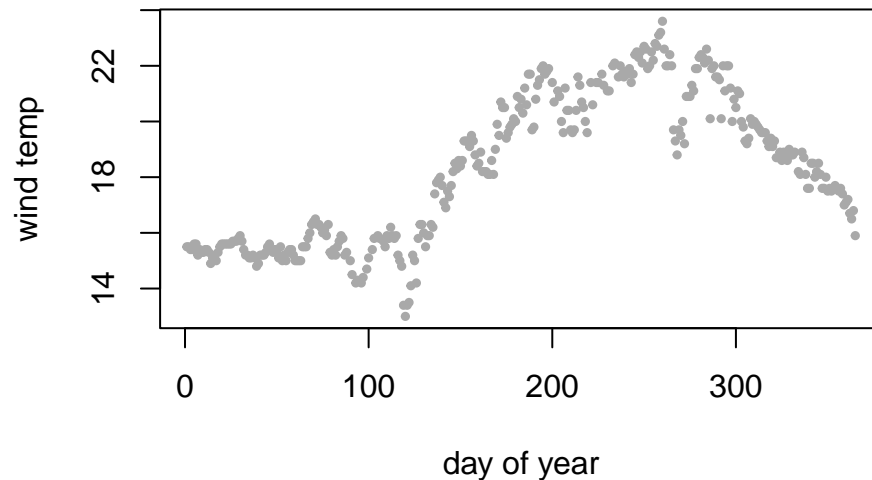
```
buoy_data %>%  
  summarize(cut(yearday, 4)) %>% table()
```

```
## .  
## (0.636,92] (92,183] (183,274] (274,365]  
##          90         86         83         90
```

```
lm(WTMP ~ cut(yearday, 4), data=buoy_data) %>%  
  tidy()
```

```
## # A tibble: 4 x 5  
##   term                estimate std.error statistic  p.value  
##   <chr>              <dbl>    <dbl>    <dbl>    <dbl>  
## 1 (Intercept)        15.4      0.153     101. 1.29e-258  
## 2 cut(yearday, 4)(92,183]  1.79    0.218      8.18 5.32e- 15  
## 3 cut(yearday, 4)(183,274]  5.83    0.220     26.5 4.86e- 85  
## 4 cut(yearday, 4)(274,365]  3.95    0.216     18.3 1.12e- 52
```

Step Function

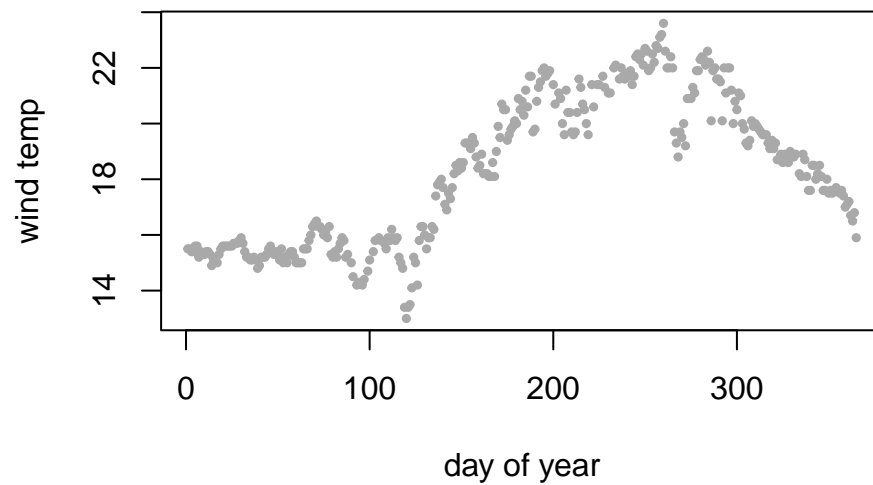


Cubic Function Directly on the plot below, sketch the estimated linear model (hint: connect a few fitted points).

```
lm(WTMP ~ poly(yearday,3, raw=TRUE), data=buoy_data) %>%  
  tidy()
```

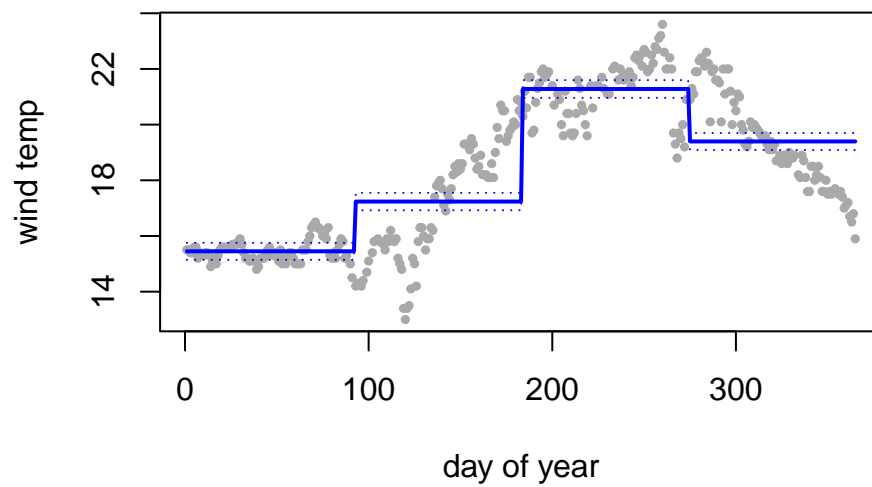
```
## # A tibble: 4 x 5  
##   term                estimate std.error statistic  p.value  
##   <chr>              <dbl>    <dbl>    <dbl>    <dbl>  
## 1 (Intercept)        1.62e+1  1.96e-1    82.3 6.55e-229  
## 2 poly(yearday, 3, raw = ~ -5.44e-2  4.70e-3   -11.6 2.16e- 26  
## 3 poly(yearday, 3, raw = ~  6.55e-4  2.99e-5    21.9 3.17e- 67  
## 4 poly(yearday, 3, raw = ~ -1.40e-6  5.39e-8   -26.0 2.14e- 83
```

Cubic Fit



Solution

Step Function



Cubic Fit

