Assignment 1 Question 1

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g. For the population below, plot the sensitivity curve from part (f) for $y \in [-10, 10]$. Make sure that you make the axes presentable, and include informative labels and titles. Based on this plot and all you have learned about the excess kurtosis in Question 1 so far, mention one good and one bad property of the excess kurtosis attribute.

```
set.seed(341)
pop <- rt(1000,10)
```

First, define a function for the excess kurtosis, $\alpha(\mathcal{P})$, attribute:

```
excess_kurtosis <- function(y.pop) {
  N <- length(y.pop)
  (((1/N) * sum((y.pop - mean(y.pop))^4)) /  ((1/N) * sum((y.pop - mean(y.pop))^2))^2) - 3
}
```

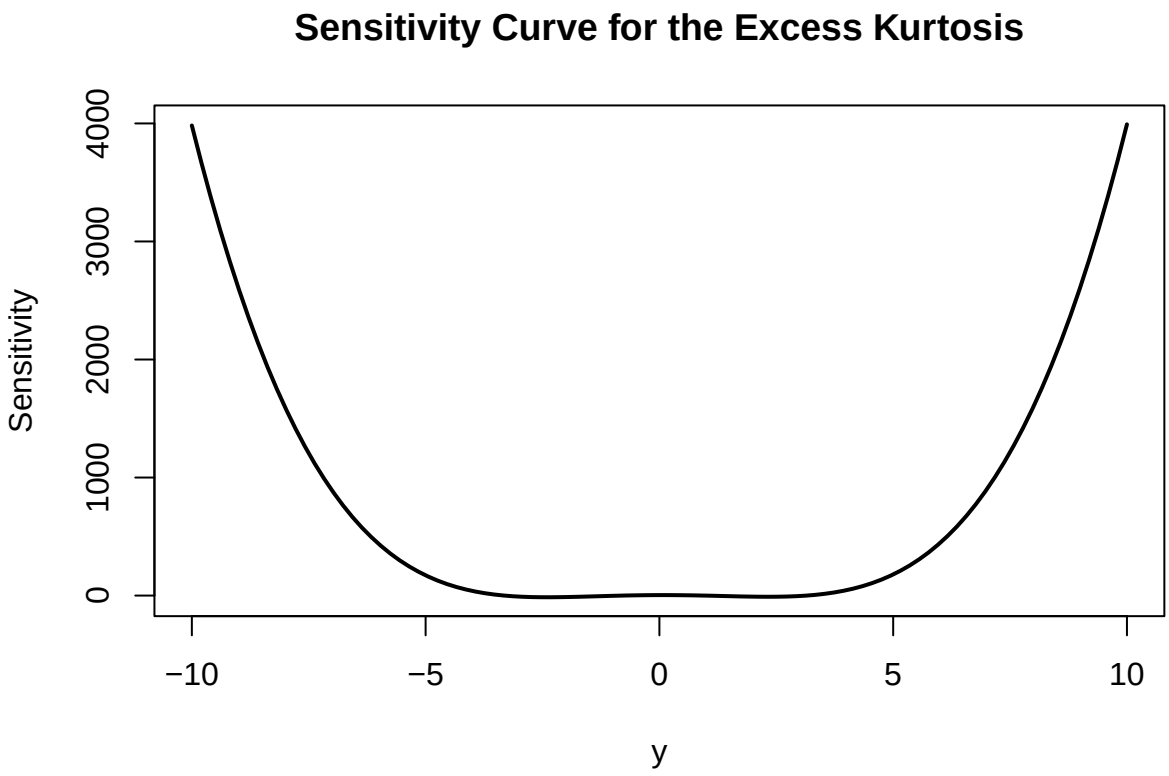
Next, define a function for Sensitivity Curve:

```
sc = function(y.pop, y, attr, ...) {
  N <- length(y.pop) +1
  sapply( y, function(y.new) {  N*(attr(c(y.new, y.pop),...) - attr(y.pop,...))  } )
}
```

Plot the Sensitivity Curve:

```
y <- seq(-10, 10, length.out = 100)

plot(y, sc(pop, y, excess_kurtosis), type="l", lwd = 2,
     main="Sensitivity Curve for the Excess Kurtosis",
     ylab="Sensitivity"
     )
```



Good Property A good property of the excess kurtosis attribute is that it is location invariant. Since this attribute measures the instances of outliers in a distribution, it would not be ideal for its value to change based on the location of the mean.

Bad Property The bad property of the excess kurtosis attribute is that its sensitivity curve is unbounded for this range (between -10 to 10). Specifically, values of a magnitude above 5 have a greater affect on the excess kurtosis attribute.