HUDM6026 Homework_05

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Q1:

Determine the first derivative of f and encode it in a function called f_prime.

MY SOLUTION:
Based on chain rule, the first derivative of $f(x)$ is

$$f(x)' = \frac{-2x}{x^2+1} + \frac{1}{3}x^{-\frac{2}{3}}$$

. Based on this equation, I write the code below. Certainly, we can use the R-built-in function to get the derivative quickly.

```
> f_prime <- function(x) {
+   out_ <- (-2*x)*((x^2 + 1)^(-1)) + (1/3)*(x^(-2/3))
+   return(out_)
+ }
```

Q2:

Create a plot of f and f on [0,4] in different colors and line types and add a legend. **MY SOLUTION:**

```
> # write the original function with the name of f_
> f_ <- function(x){
+   out_ <- (-1)*log(x^2 + 1) + x^(1/3)
+   return(out_)}
> f_(1)
[1] 0.3068528
> # first plot the original function
> x <- seq(0,4,0.01)
> # plot the original function with blue line
> plot(x, f_(x), col="blue", type = "l", ylim = c(-1.5,1))
> # plot the first derivative with red line
> lines(x, f_prime(x), col="red", type = "l")
> # add the legend
> legend(3,1, inset = 0.1, c("f_","f_prime"), lty = 1,
+        col = c("blue","red"), title="line Type")
> # add a horizontal line to indicate the y=0
> abline(h=0,lty=3)
```