[onlymath]serif

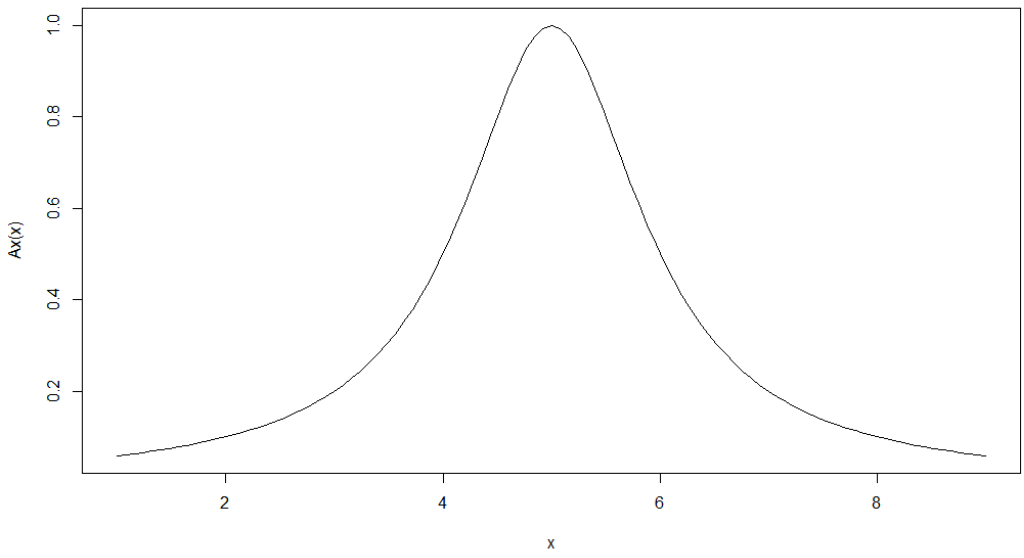
Definitions and Basic Properties

Membership function:

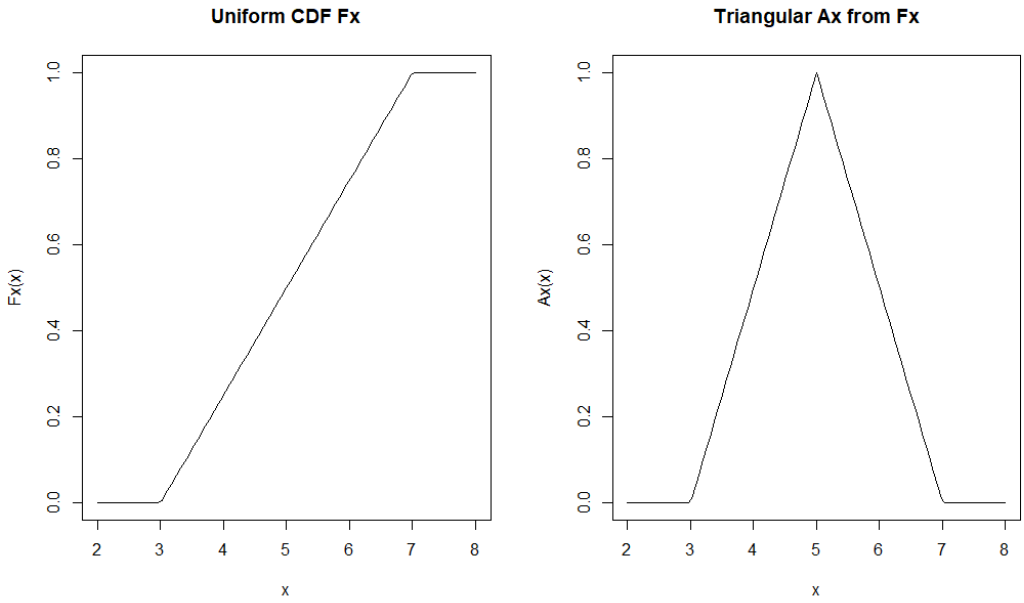
$$A(x) = \frac{1}{1 + (x-5)^2}$$

its graph:

```
# real number 'close to 5'

Ax = function(x) {
    1 / (1 + (x-5)^2)
}

curve(Ax, from = 1, to = 9)
```



```r
# plot# Set up plotting area
par(mfrow = c(1,2))

# 2. Fx (uniform CDF)
Fx = function(x, a, b) ifelse(x < a, 0, ifelse(x <= b, (x-a)/(b-a), 1))
curve(Fx(x, 3, 7), 2, 8, main = "Uniform CDF Fx", ylab = "Fx(x)", col = "black")

# 3. Ax from Fx (triangular)
Ax = function(x, a, b) {
  mu <- (a+b)/2
  ifelse(x <= mu, 2*Fx(x,a,b), 2*(1-Fx(x,a,b)))
}
curve(Ax(x, 3, 7), 2, 8, main = "Triangular Ax from Fx", ylab = "Ax(x)", col = "b
curve(Ax, from = 1, to = 9)
```



References

Brockwell, P. J., Davis, R. A. (2002). Introduction to Time Series and Forecasting (2nd ed.). Springer.

Julien Rosset, Laurent Donzé, Fuzzy Least Squares and Fuzzy Orthogonal Least Squares Linear Regressions. IJCCI 2023: 359-368