AI_Assignment 2

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Gaussian membership function

$$\mu_A(x, c, s, m) = \exp\left[\frac{-1}{2}\left|\frac{x-c}{s}\right|^m\right]$$

$c = 5 \quad s = 2$ constant

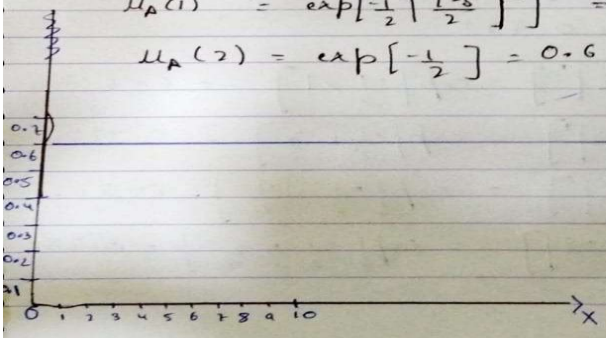
$m = 0, 1, 2, 3, 4, 5$

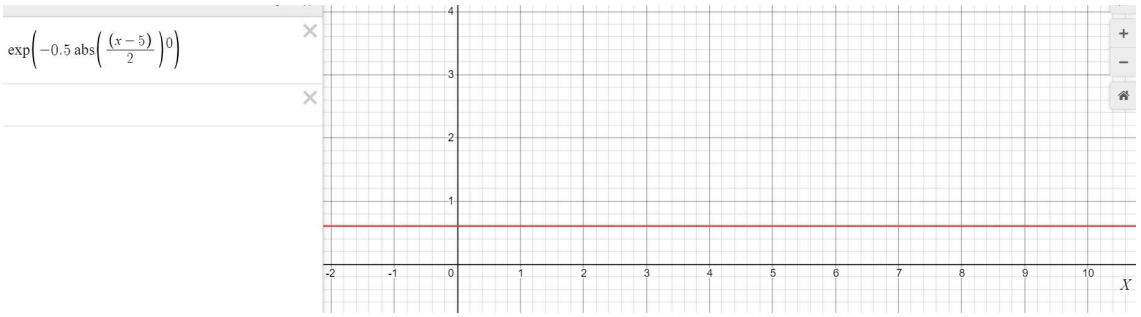
① $c = 5, \ s = 2, \ m = 0$

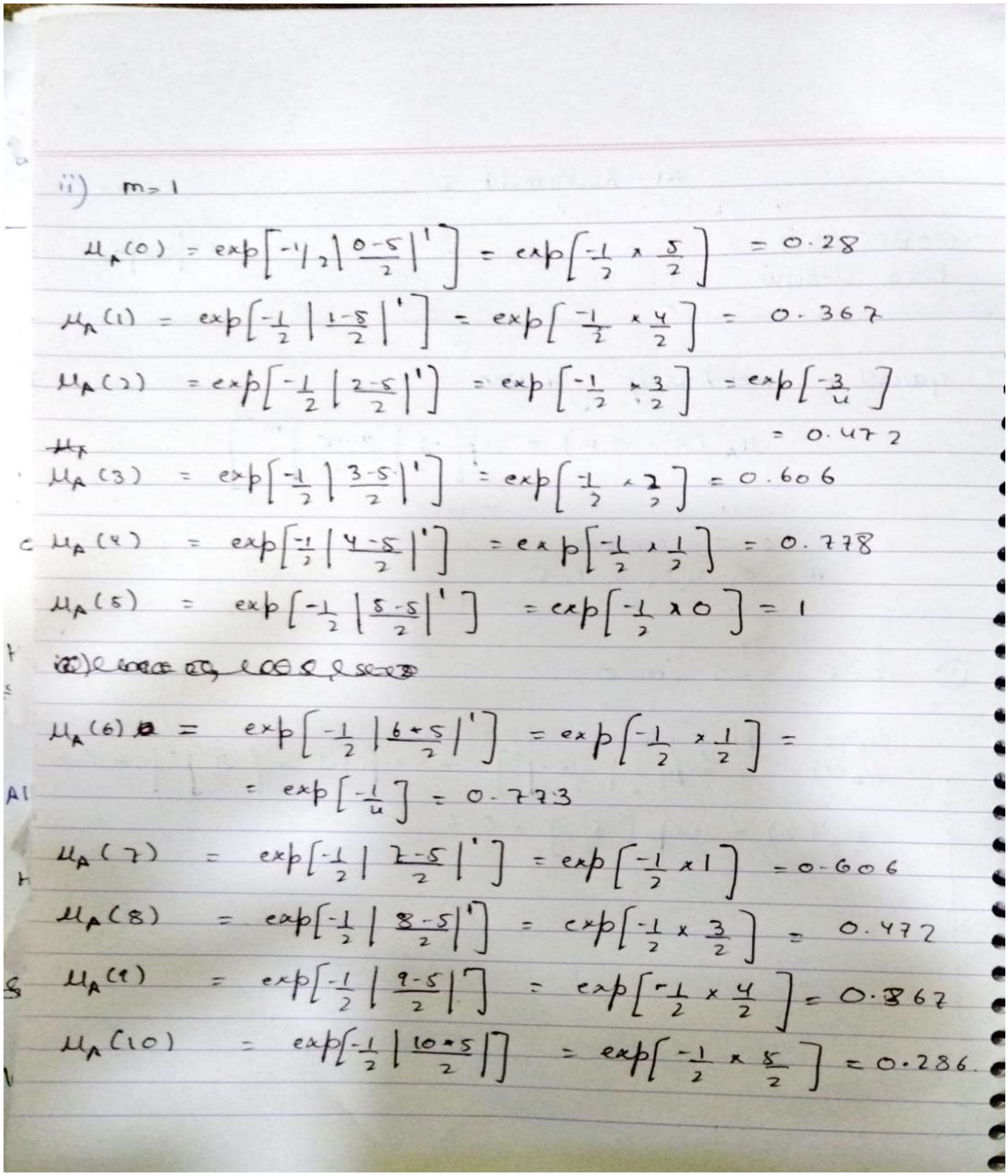
$$\mu_A(0) = \exp\left[\frac{-1}{2}\right] = 0.606$$

$$\mu_A(1) = \exp\left[\frac{-1}{2}\left|\frac{1-5}{2}\right|^0\right] = \exp\left[\frac{-1}{2} \cdot \left[\frac{-4}{2}\right]^0\right] = 0.6$$

$$\mu_A(2) = \exp\left[\frac{-1}{2}\right] = 0.6$$







ii) $m = 1$

$\mu_A(0) = \exp\left[-\frac{1}{2}\left|\frac{0-5}{2}\right|^1\right] = \exp\left[\frac{-1}{2} \times \frac{5}{2}\right] = 0.28$

$\mu_A(1) = \exp\left[-\frac{1}{2}\left|\frac{1-5}{2}\right|^1\right] = \exp\left[\frac{-1}{2} \times \frac{4}{2}\right] = 0.367$

$\mu_A(2) = \exp\left[-\frac{1}{2}\left|\frac{2-5}{2}\right|^1\right] = \exp\left[-\frac{1}{2} \times \frac{3}{2}\right] = \exp\left[\frac{-3}{4}\right]$

$= 0.472$

$\mu_A(3) = \exp\left[-\frac{1}{2}\left|\frac{3-5}{2}\right|^1\right] = \exp\left[\frac{-1}{2} \times \frac{2}{2}\right] = 0.606$

$\mu_A(4) = \exp\left[-\frac{1}{2}\left|\frac{4-5}{2}\right|^1\right] = \exp\left[\frac{-1}{2} \times \frac{1}{2}\right] = 0.778$

$\mu_A(5) = \exp\left[-\frac{1}{2}\left|\frac{5-5}{2}\right|^1\right] = \exp\left[\frac{-1}{2} \times 0\right] = 1$

$\mu_A(6) = \exp\left[-\frac{1}{2}\left|\frac{6-5}{2}\right|^1\right] = \exp\left[\frac{-1}{2} \times \frac{1}{2}\right] =$

$= \exp\left[\frac{-1}{4}\right] = 0.773$

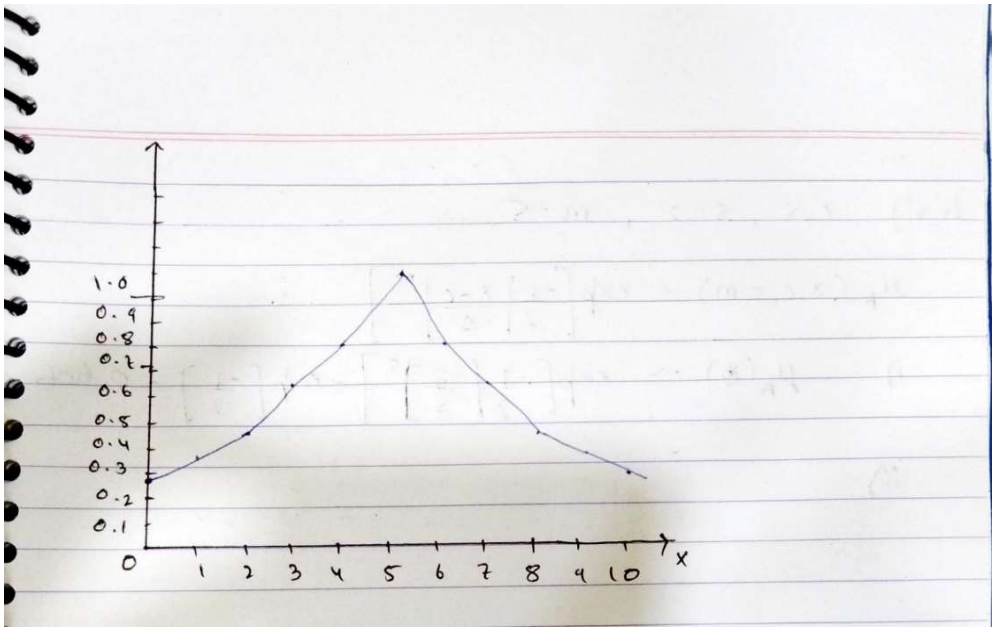
$\mu_A(7) = \exp\left[-\frac{1}{2}\left|\frac{7-5}{2}\right|^1\right] = \exp\left[\frac{-1}{2} \times 1\right] = 0.606$

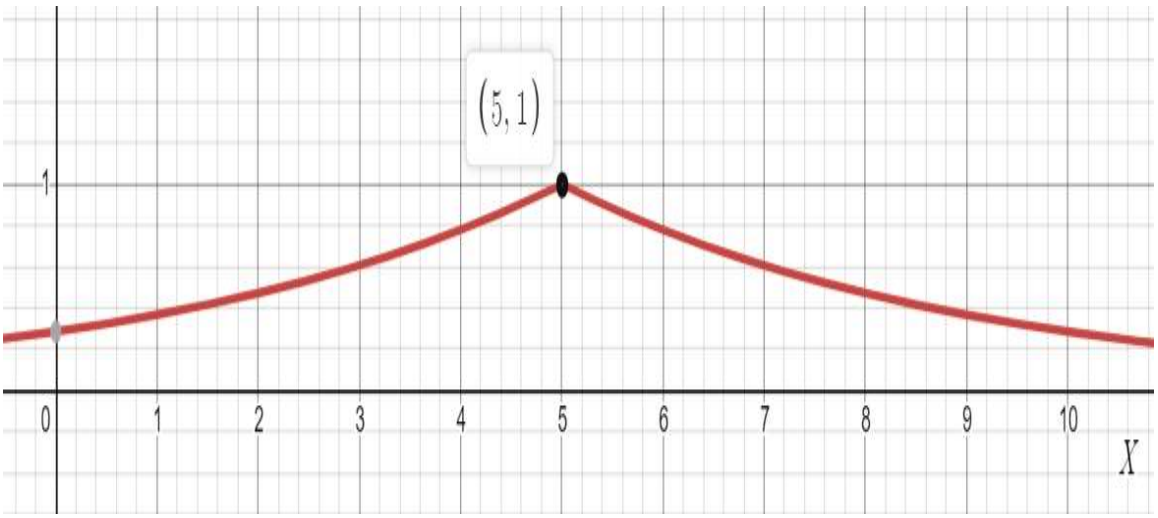
$\mu_A(8) = \exp\left[-\frac{1}{2}\left|\frac{8-5}{2}\right|^1\right] = \exp\left[\frac{-1}{2} \times \frac{3}{2}\right] = 0.472$

$\mu_A(9) = \exp\left[-\frac{1}{2}\left|\frac{9-5}{2}\right|^1\right] = \exp\left[\frac{-1}{2} \times \frac{4}{2}\right] = 0.367$

$\mu_A(10) = \exp\left[-\frac{1}{2}\left|\frac{10-5}{2}\right|^1\right] = \exp\left[\frac{-1}{2} \times \frac{5}{2}\right] = 0.286.$

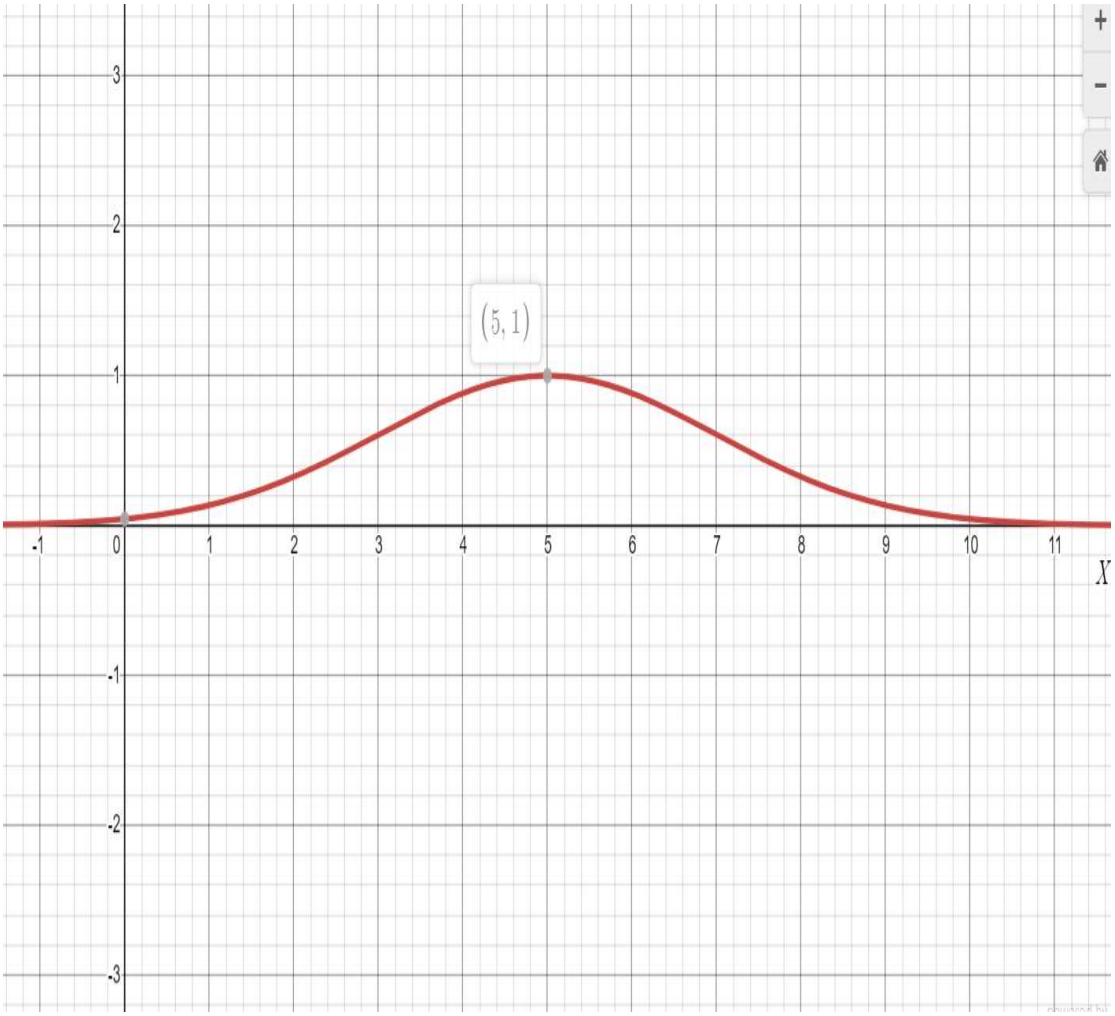
$$\exp\left(-0.5\,\mathrm{abs}\left(\frac{(x-5)}{2}\right)1\right)$$


1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1 2 3 4 5 6 7 8 9 10
x


(5,1)
1
0 1 2 3 4 5 6 7 8 9 10
X

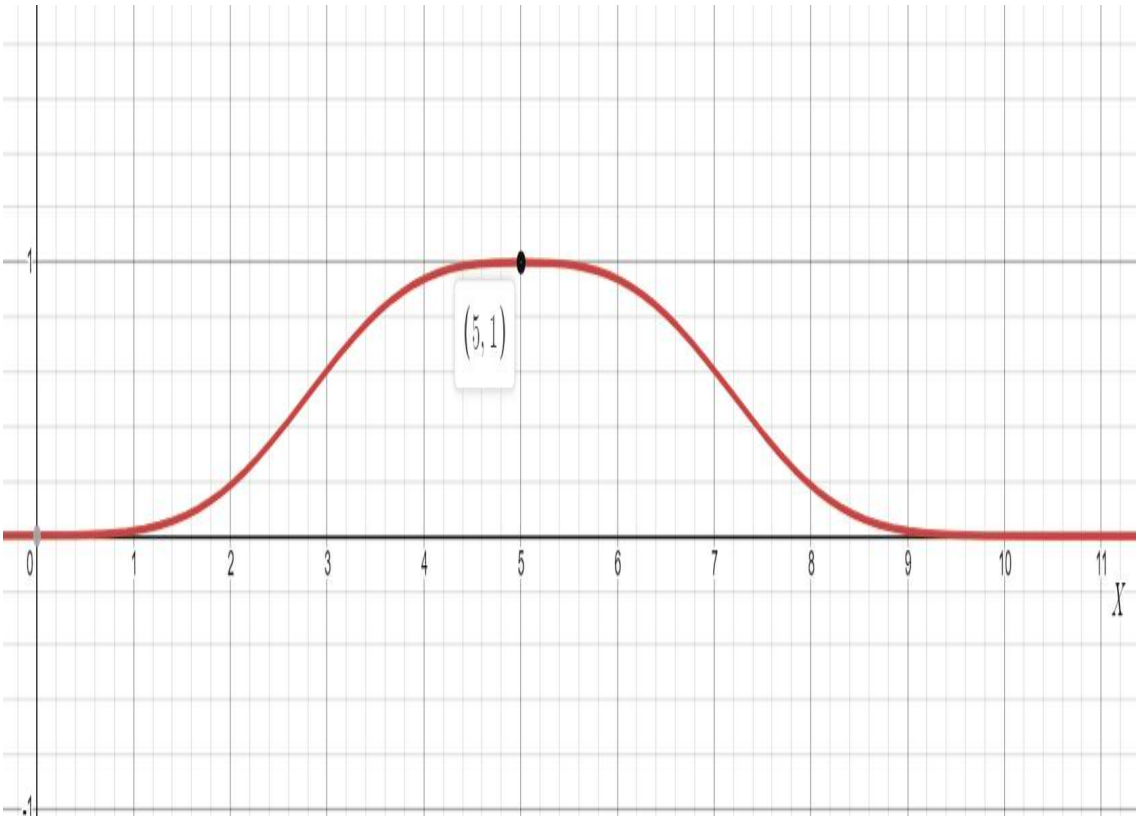
iii) $m = 2$, $c = 5$, $s = 2$

$$\mu_A(x) = \exp\left[-\frac{1}{2} \left| \frac{x-5}{2} \right|^2 \right]$$



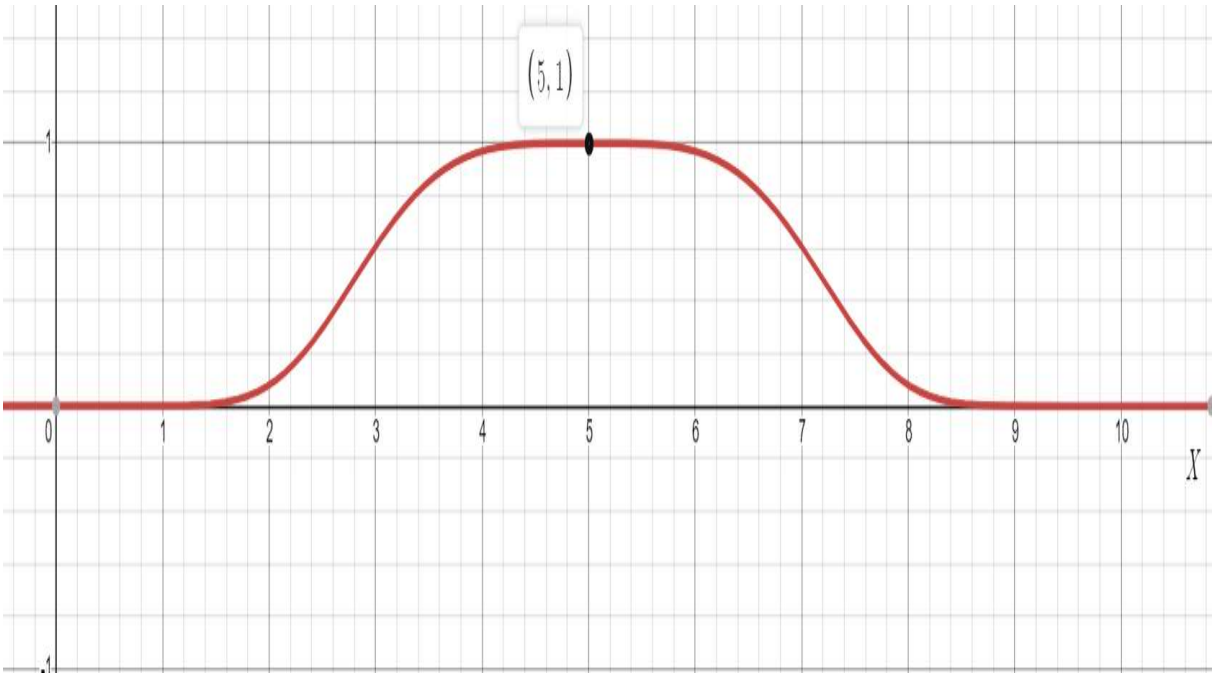
iv) $m = 3, \quad c = 5, \quad s = 2$

$$\mu_A(x) = \exp\left[-\frac{1}{2}\left|\frac{x-5}{2}\right|^3\right]$$



v) $m=4, \quad c=5, \quad s=2$

$$\mu_A(x) = \exp\left[\frac{-1}{2}\left|\frac{x-5}{2}\right|^4\right]$$



iii) $m = 5$, $c = 5$, $s = 2$

$$\mu_A(x) = \exp\left[\frac{-1}{2}\left|\frac{x-5}{2}\right|^5\right]$$