Collected papers of

Lord Soumadeep Ghosh

Volume 8

The Ghosh staircase function

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe the Ghosh staircase function. The paper ends with "The End"

Introduction

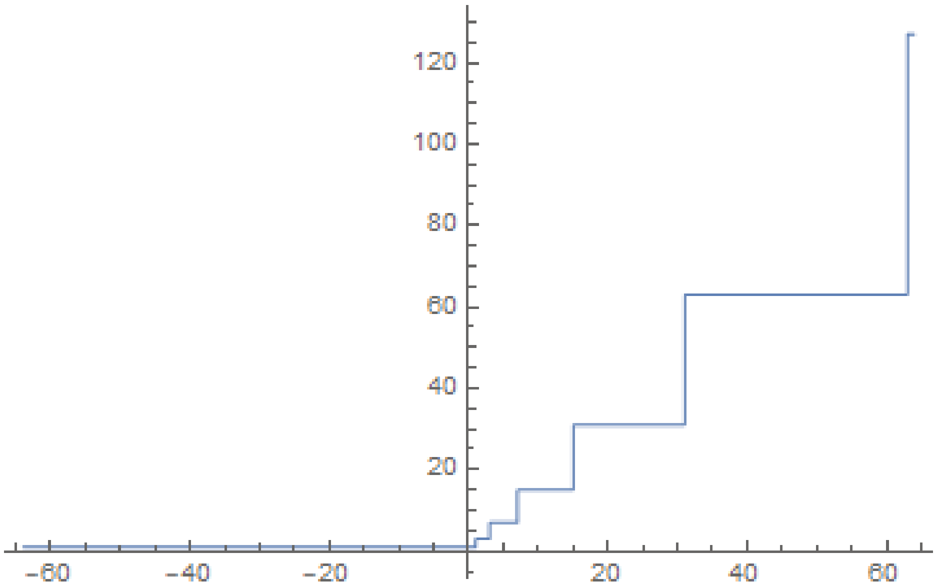
The Ghosh staircase function is the alternative holy grail of functions. In this paper, I describe the Ghosh staircase function.

The Ghosh staircase function

The Ghosh staircase function is

$$G(x) = \begin{cases} 1 & x \leq 1 \\ 2G(\frac{x-1}{2}) + 1 & x > 1 \end{cases}$$

Plot of the Ghosh staircase function



The End

The Ghosh pulse function

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe the Ghosh pulse function. The paper ends with "The End"

Introduction

The Ghosh pulse function is a useful alternative to the sinc function. In this paper, I describe the Ghosh pulse function.

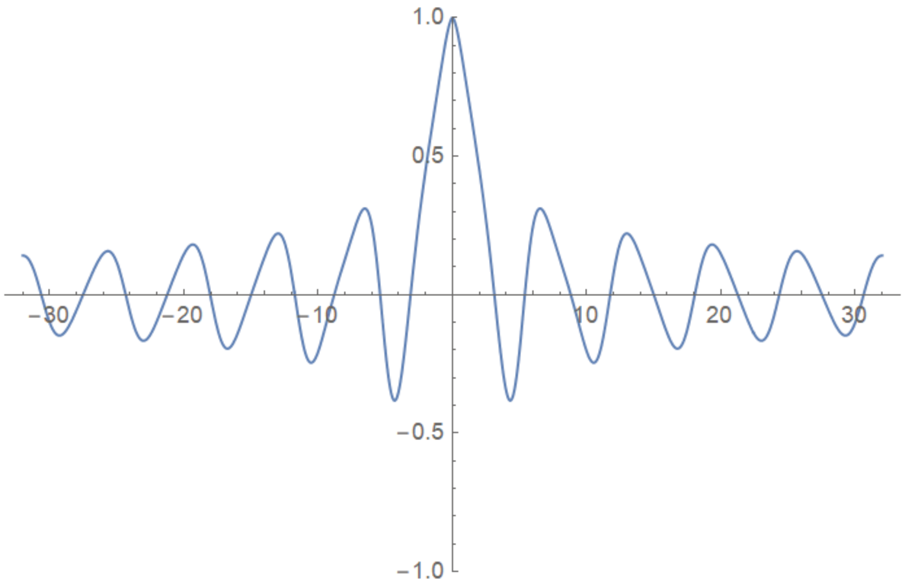
The Ghosh pulse function

The Ghosh pulse function is

$$P(x) = J_{J_2(|x|)}(|x|)$$

where
$J_n(x)$ is the Bessel function of the first kind.

Plot of the Ghosh pulse function



The End

The Modified V probability density function

Soumadeep Ghosh

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Abstract

In this paper, I describe the Modified V probability density function which is never 1. The paper ends with "The End"

Introduction

It is often useful to have a V-shaped probability density function that is never 1. In this paper, I describe the Modified V probability density function which is never 1.

The Modified V probability density function

The Modified V probability density function is

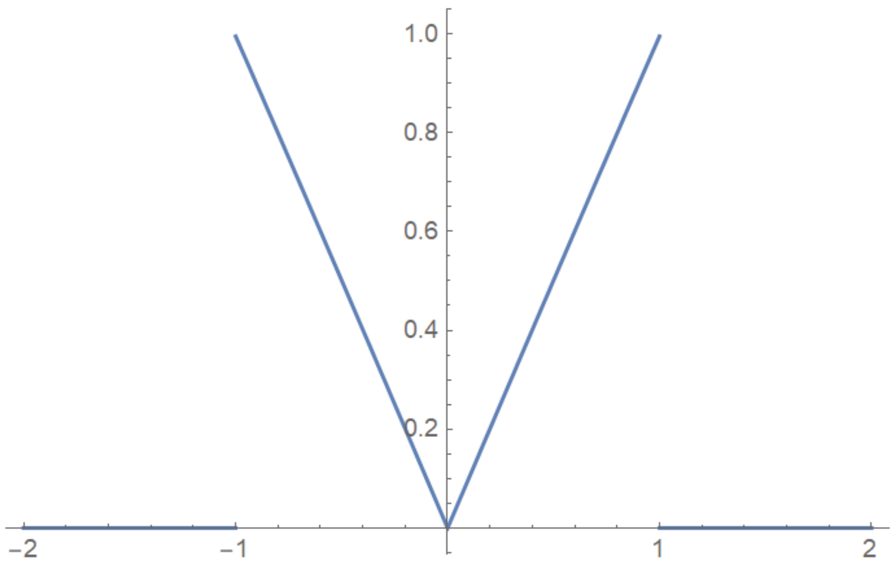
$$f(x) = \begin{cases} \frac{5(x^2-128)(x^2(x^2-128)^2-8388608)}{5342576161}|x| & |x| \leq 1 \\ 0 & |x| > 1 \end{cases}$$

Then

1. $0 \leq f(x) < 1$ for all real x.
2. $\int_{-\infty}^{\infty} f(x) = 1$

Thus f(x) is a probability density function which is never 1 for any real x.

Plot of the Modified V probability density function



The End

The Ridge probability density function

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe the Ridge probability density function which is never 1 and also constant for some values. The paper ends with "The End"

Introduction

It is often useful to have a V-shaped probability density function that is never 1 and also constant for some values. In this paper, I describe the Ridge probability density function which is never 1 and also constant for some values.

The Ridge probability density function

The Ridge probability density function is

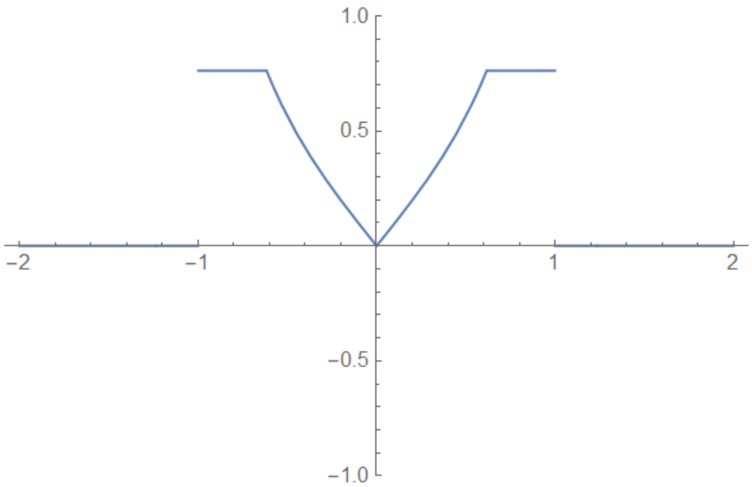
$$f(x) = \frac{8\left(\begin{cases} \min\left(1, \left|\tan\left(\frac{4x}{\pi}\right)\right|\right) & |x| \leq 1 \\ 0 & |x| > 1 \end{cases} \right)}{16 - \pi^2 + 2\pi \log(2)}$$

Then

1. $0 \leq f(x) < 1$ for all real x.
2. $\int_{-\infty}^{\infty} f(x) = 1$

Thus f(x) is a probability density function which is never 1 for any real x.

Plot of the Ridge probability density function



The End

The Generalized Observable Rate Equation and solutions

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe the Generalized Observable Rate Equation and solutions. The paper ends with "The End"

Introduction

It's a well-known fact that a low interest rate promotes lending and a high interest rate discourages borrowing. Thus, the observable interest rate is somewhere in the middle, neither low nor high. This fact is modeled by the **Generalized Observable Rate Equation (GORE)**. In this paper, I describe the Generalized Observable Rate Equation and solutions.

The Generalized Observable Rate Equation

The Generalized Observable Rate Equation is

$$\alpha(1+\frac{r(t)}{t})+\beta(1+\frac{\partial r(t)}{\partial t})+\gamma=0$$

where
$r(t)$ is interest rate as a function of time
α, β and γ are constants

The solution to the Generalized Observable Rate Equation

The solution to the Generalized Observable Rate Equation is

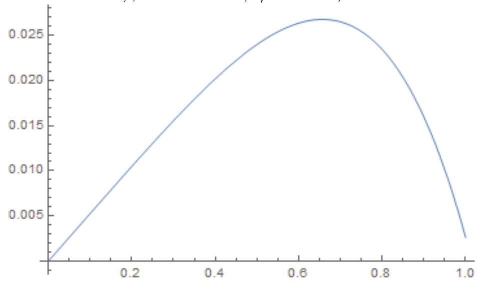
$$r(t)=\delta t^{\alpha/\beta}-\frac{t(-\alpha+\beta+\gamma)}{\beta(1-\frac{\alpha}{\beta})}$$

where
δ is a constant of integration

A particular solution to the Generalized Observable Rate Equation with moderately low interest rate

A particular solution to the Generalized Observable Rate Equation with moderately low interest rate is given by

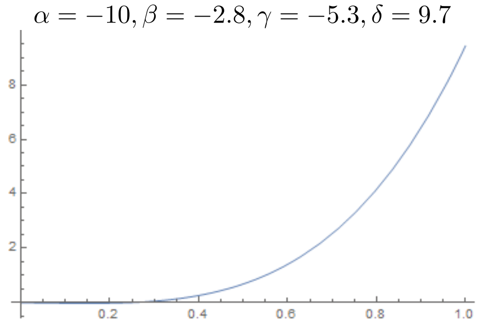
$$\alpha = 0.86, \beta = 0.195, \gamma = 0.7, \delta = -0.05$$



A particular solution to the Generalized Observable Rate Equation with moderately high interest rate

A particular solution to the Generalized Observable Rate Equation with moderately high interest rate is given by

$$\alpha = -10, \beta = -2.8, \gamma = -5.3, \delta = 9.7$$



The End

The Airy Peak probability density function

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe the Airy Peak probability density function which is never 1. The paper ends with "The End"

Introduction

It is often useful to have an inverted V-shaped probability density function that is never 1. In this paper, I describe the Airy Peak probability density function which is never 1.

The Airy Peak probability density function

The Airy Peak probability density function is

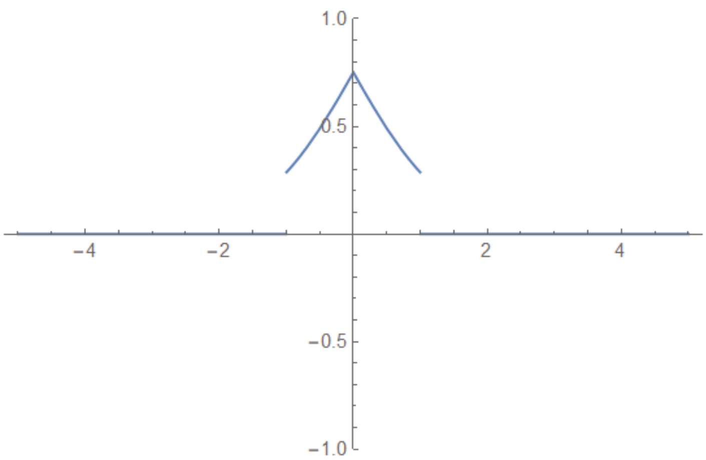
$$f(x) = \begin{cases} \dfrac{Ai(|x|)}{\frac{\Gamma(-\frac{1}{3})\,{}_1F_2(\frac{2}{3};\frac{4}{3},\frac{5}{3};\frac{1}{9})}{2\ 3^{5/6}\pi} - \frac{2\sqrt[3]{3}\,{}_1F_2(\frac{1}{3};\frac{2}{3},\frac{4}{3};\frac{1}{9})}{\Gamma(-\frac{1}{3})}} & -1 \leq x \leq 1 \\ 0 & x > 1 \lor x < -1 \end{cases}$$

where
$Ai(x)$ is the Airy function
${}_pF_q(a;b;x)$ is the generalized hypergeometric function
Then

1. $0 \leq f(x) < 1$ for all real x.
2. $\int_{-\infty}^{\infty} f(x) = 1$

Thus f(x) is a probability density function which is never 1 for any real x.

Plot of the Airy Peak probability density function



The End

The Airy Valley probability density function

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe the Airy Valley probability density function which is never 1. The paper ends with "The End"

Introduction

It is often useful to have an alternative V-shaped probability density function that is never 1. In this paper, I describe the Airy Valley probability density function which is never 1.

The Airy Valley probability density function

The Airy Valley probability density function is

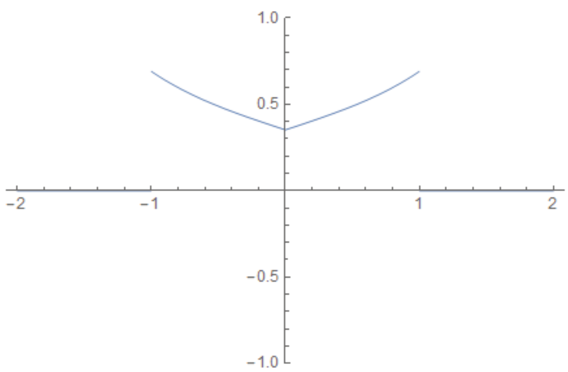
$$f(x) = \begin{cases} \dfrac{Bi(|x|)}{-\frac{2\ 3^{5/6}\ {}_1F_2(\frac{1}{3};\frac{2}{3},\frac{4}{3};\frac{1}{9})}{\Gamma(-\frac{1}{3})} - \frac{\Gamma(-\frac{1}{3})\ {}_1F_2(\frac{2}{3};\frac{4}{3},\frac{5}{3};\frac{1}{9})}{2\sqrt[3]{3}\pi}} & -1 \leq x \leq 1 \\ 0 & x < -1 \vee x > 1 \end{cases}$$

where
$Bi(x)$ is the Airy function
${}_pF_q(a;b;x)$ is the generalized hypergeometric function
Then

1. $0 \leq f(x) < 1$ for all real x.
2. $\int_{-\infty}^{\infty} f(x) = 1$

Thus f(x) is a probability density function which is never 1 for any real x.

Plot of the Airy Valley probability density function



The End

The Alternative Ridge probability density function

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe the Alternative Ridge probability density function which is never 1 and also constant for some values. The paper ends with "The End"

Introduction

It is often useful to have an alternative V-shaped probability density function that is never 1 and also constant for some values. In this paper, I describe the Alternative Ridge probability density function which is never 1 and also constant for some values.

The Alternative Ridge probability density function

The Alternative Ridge probability density function is

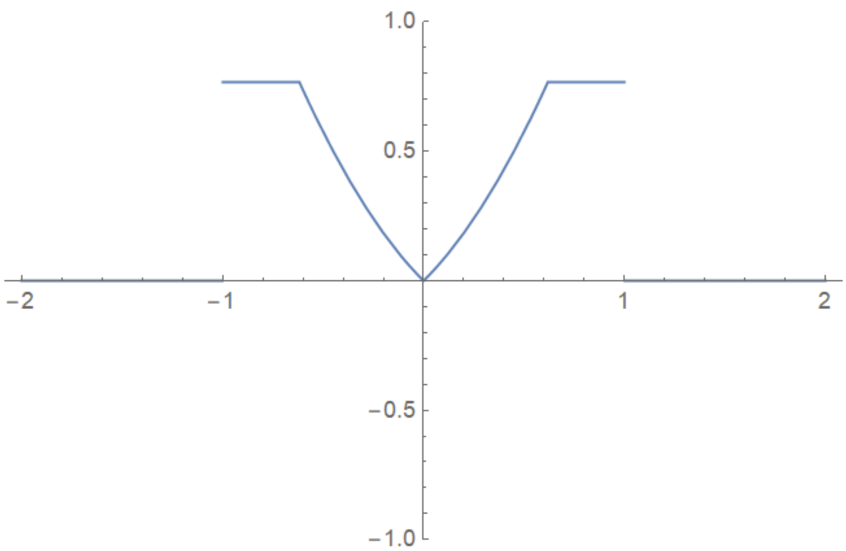
$$f(x) = \begin{cases} \frac{6\min(1,|x|+x^2)}{19-5\sqrt{5}} & -1 \leq x \leq 1 \\ 0 & x < -1 \vee x > 1 \end{cases}$$

Then

1. $0 \leq f(x) < 1$ for all real x.
2. $\int_{-\infty}^{\infty} f(x) = 1$

Thus f(x) is a probability density function which is never 1 for any real x.

Plot of the Alternative Ridge probability density function



The End

The Umbrella probability density function

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe the Umbrella probability density function which is never 1. The paper ends with "The End"

Introduction

In this paper, I describe the Umbrella probability density function which is never 1.

The Umbrella probability density function

The Umbrella probability density function is

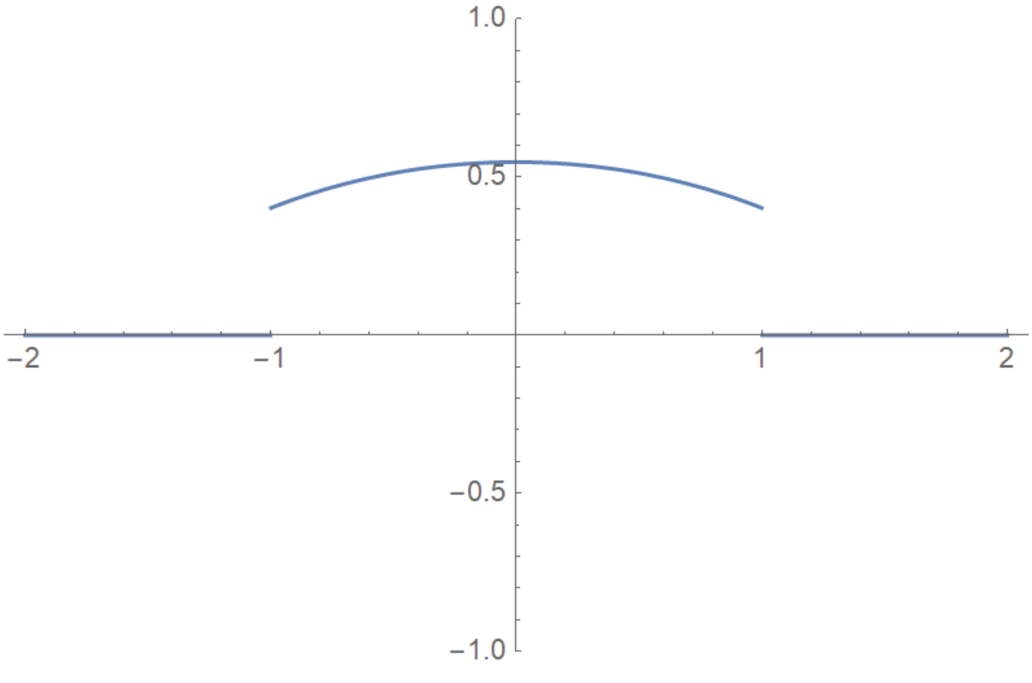
$$f(x) = \begin{matrix} \frac{480}{877}(1 - \frac{x^4}{64} - \frac{x^2}{4}) & -1 \leq x \leq 1 \\ 0 & x < -1 \vee x > 1 \end{matrix}$$

Then

1. $0 \leq f(x) < 1$ for all real x.
2. $\int_{-\infty}^{\infty} f(x) = 1$

Thus f(x) is a probability density function which is never 1 for any real x.

Plot of the Umbrella probability density function



The End

The Dome probability density function

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe the Dome probability density function which is never 1. The paper ends with "The End"

Introduction

In this paper, I describe the Dome probability density function which is never 1.

The Dome probability density function

The Dome probability density function is

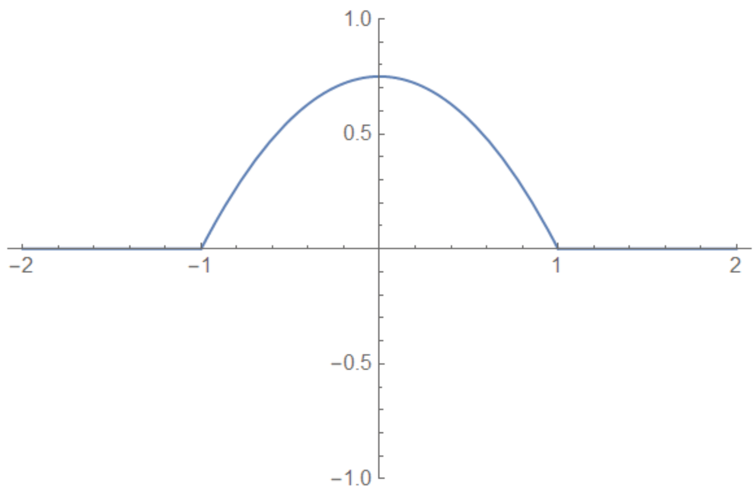
$$f(x) = \frac{2}{3}\max(0, (x+1)(\frac{3}{2} - \frac{9}{8}(x+\frac{1}{3})))$$

Then

1. $0 \leq f(x) < 1$ for all real x.
2. $\int_{-\infty}^{\infty} f(x) = 1$

Thus f(x) is a probability density function which is never 1 for any real x.

Plot of the Dome probability density function



The End

The Uniform probability density function

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe the Uniform probability density function which is never 1. The paper ends with "The End"

Introduction

In this paper, I describe the Uniform probability density function which is never 1.

The Uniform probability density function

The Uniform probability density function is

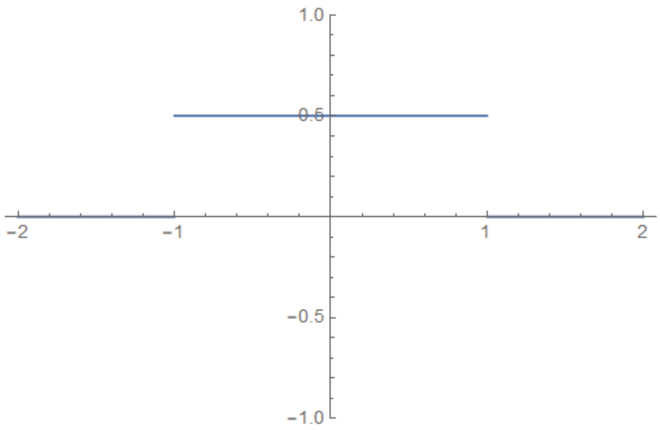
$$f(x) = \begin{cases} \frac{1}{2} & -1 \leq x \leq 1 \\ 0 & x < -1 \lor x > 1 \end{cases}$$

Then

1. $0 \leq f(x) < 1$ for all real x.
2. $\int_{-\infty}^{\infty} f(x) = 1$

Thus f(x) is a probability density function which is never 1 for any real x.

Plot of the Uniform probability density function



The End