Daniel Cu Sánchez
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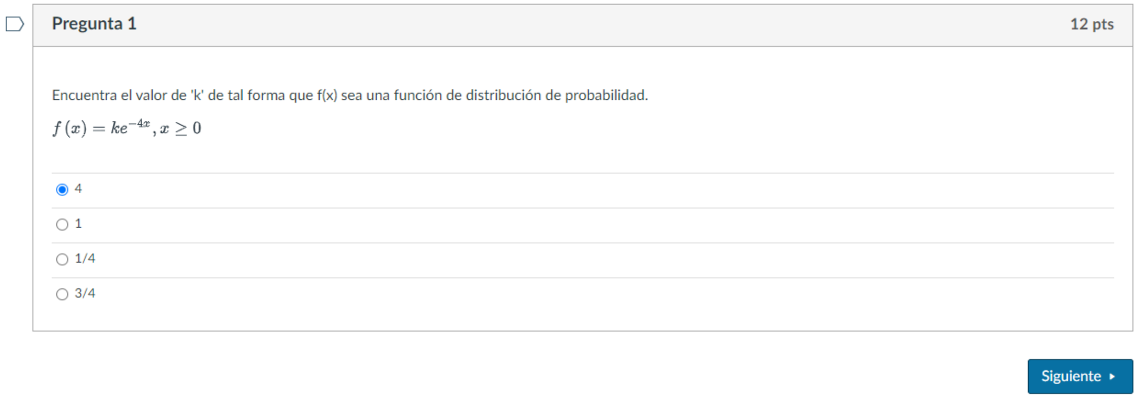

Pregunta 1 12 pts

Encuentra el valor de 'k' de tal forma que f(x) sea una función de distribución de probabilidad.

$f(x) = ke^{-4x}, x \geq 0$

- (•) 4
- ( ) 1
- ( ) 1/4
- ( ) 3/4

Siguiente ▸

Despejamos k.

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Pregunta 2 12 pts

Given the following probability distribution function (pdf)

$$f(x)=\begin{cases}\frac{1}{75}x, & x\in[0,10)\\ \frac{2}{5}-\frac{2}{75}x, & x\in[10,15)\end{cases}$$

Choose its corresponding cumulative distribution function (CDF)

$$\mathcal{F}1(x)=\begin{cases}0, & x\in(-\infty,0)\\ \frac{1}{150}x^2, & x\in[0,10)\\ -\frac{1}{75}x^2+\frac{2}{5}x+2, & x\in[10,15)\\ 1, & x\in[15,\infty)\end{cases}\qquad \mathcal{F}3(x)=\begin{cases}0, & x\in(-\infty,0)\\ \frac{1}{150}x^2+1, & x\in[0,10)\\ -\frac{1}{75}x^2+\frac{2}{5}x, & x\in[10,15)\\ 1, & x\in[15,\infty)\end{cases}$$

$$\mathcal{F}2(x)=\begin{cases}0, & x\in(-\infty,0)\\ \frac{1}{150}x^2, & x\in[0,10)\\ -\frac{1}{75}x^2+\frac{2}{5}x-2, & x\in[10,15)\\ 1, & x\in[15,\infty)\end{cases}\qquad \mathcal{F}4(x)=\begin{cases}0, & x\in(-\infty,0)\\ \frac{1}{150}x^2-1, & x\in[0,10)\\ -\frac{1}{75}x^2+\frac{2}{5}x, & x\in[10,15)\\ 1, & x\in[15,\infty)\end{cases}$$

- ○ F4(x)
- ◉ F2(x)
- ○ F1(x)
- ○ F3(x)

WolframAlpha inteligencia computacional.

$$\int_0^x \frac{1}{75}x\,dx$$

LENGUAJE NATURAL | ENTRADA MATEMÁTICA

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Integral definida

$$\int_0^x \frac{x}{75}\,dx=\frac{x^2}{150}$$

Integral indefinida — Solución paso a paso

$$\int \frac{x}{75}\,dx=\frac{x^2}{150}+\text{constante}$$

Potenciado por WOLFRAM LANGUAGE

$$\int_0^{10} \frac{1}{75}x\,dx+\int_{10}^{x} \frac{2}{5}-\frac{2}{75}x\,dx$$

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Entrada

$$\int_0^{10}\frac{1}{75}x\,dx+\int_{10}^{x}\left(\frac{2}{5}-\frac{2}{75}x\right)dx$$

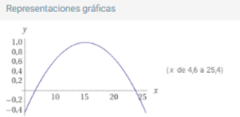
Resultado exacto

$$-\frac{2}{75}\left(\frac{x^2}{2}-50\right)+\frac{2(x-10)}{5}+\frac{2}{3}$$

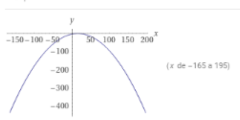
Resultado del cálculo

$$\int_0^{10}\frac{x}{75}\,dx+\int_{10}^{x}\left(\frac{2}{5}-\frac{2x}{75}\right)dx=-\frac{2}{75}\left(\frac{x^2}{2}-50\right)+\frac{2(x-10)}{5}+\frac{2}{3}$$

Representaciones gráficas



(x de 4,6 a 25,4)



(x de −165 a 195)

Formas alternativas — Más

$$\frac{1}{75}(-x^2+30x-150)$$

$$-\frac{1}{75}(x-30)x-2$$

$$\left(\frac{2}{5}-\frac{x}{75}\right)x-2$$

Forma expandida

$$-\frac{x^2}{75}+\frac{2x}{5}-2$$

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Pregunta 3 12 pts

Given the following Cumulative Distribution Function (CDF)

$$\mathcal{F}(x) = \begin{cases} 0, & x \in (-\infty, 0) \\ 2x^2, & x \in [0, 0.5) \\ -2x^2 + 4x - 1, & x \in [0.5, 1) \\ 1, & x \in [1, \infty) \end{cases}$$

Which one is its corresponding Probability Density Function (pdf)?

$$f_1(x) = \begin{cases} \frac{2}{3}x^3, & x \in [0, 0.5) \\ -\frac{2}{3}x^3 + 2x^2 - x, & x \in [0.5, 1) \end{cases}$$

$$f_2(x) = \begin{cases} 4x, & x \in [0, 0.5) \\ -4x + 4, & x \in [0.5, 1) \end{cases}$$

- (●) f2(x)
- ( ) f1(x)

WolframAlpha inteligencia computacional.

derivar -2x ^2+4x-1

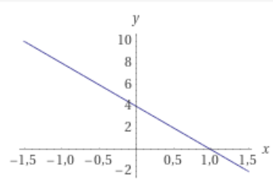
LENGUAJE NATURAL | ENTRADA MATEMÁTICA

POPULAR

Derivada | Solución paso a paso

$$\frac{d}{dx}(-2x^2 + 4x - 1) = 4 - 4x$$

Representación gráfica



(x de −1,5 a 1,5)

Figura geométrica | Propiedades

línea

Forma alternativa

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Pregunta 4 12 pts

Load the following data set numbers01.txt

Plot the histogram, what seems to be the distribution the data set comes from?

- ○ Exponential
- ○ Normal
- ◉ Uniform

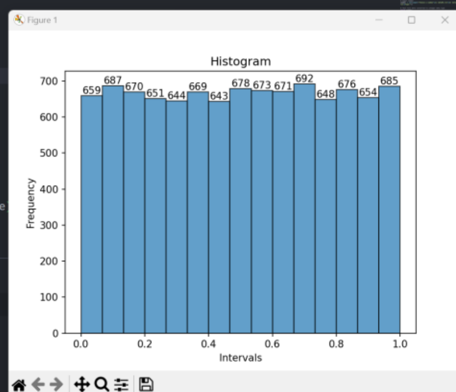
◂ Anterior | Siguiente ▸

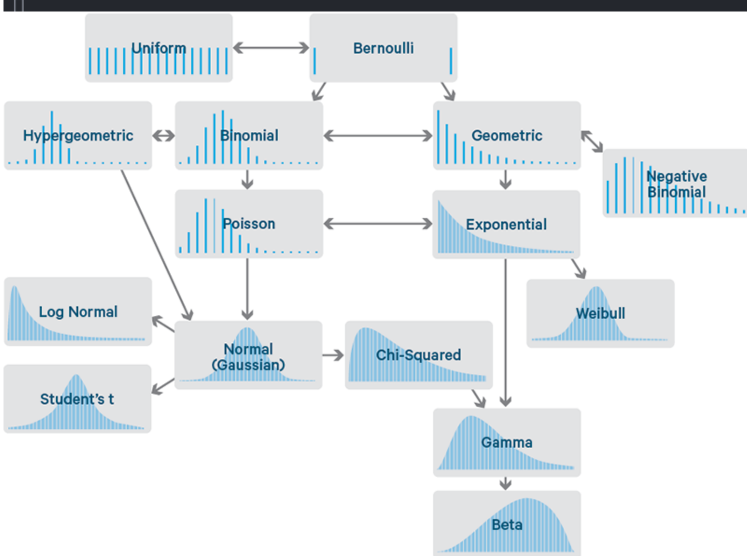
```
txt\nType:"))

# Text file data converted to integer data type
match number:
    case 1:
        file = "numbers01.txt"
    case 2:
        file = "data02.txt"
    case 3:
        file = "data03.txt"
# Load array
array_data = np.loadtxt(file, dtype=float)

classes = math.ceil(1 + (3.3 * math.log10(array_data.size
w = array_data.size / classes
print("c = ",classes)
print("max = ",array_data.max())
```

PROBLEMAS TERMINAL

TERMINAL

```
c =  15
max =  0.9999740608036397
min =  0.00025932304573213823
w =  0.0666476491838605
table =  [2.59323046e-04 6.69069722e-02 1.33554621e-01 2.00202271e-01
 2.66849920e-01 3.33497569e-01 4.00145218e-01 4.66792867e-01
 5.33440517e-01 6.00088166e-01 6.66735815e-01 7.33383464e-01
 8.00031113e-01 8.66678762e-01 9.33326412e-01 9.99974061e-01]
sum of frequencies =  10000.0
```





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Pregunta 5 — 12 pts

Using the Linear Congruential Method, generate 1000 numbers with the following parameters: X0 = 88, a = 50, c = 2, m = 100

Use the chi-squared test (with C = 10 and W = 0.10) and choose the calculated value for χ^2

- ○ 9
- ● 9000
- ○ 900
- ○ 90

proyecto_p1 > chi2.py > ...

```python
# import the observed numbers
import math
import numpy as np
numbers = np.loadtxt("output.txt", dtype=float)


observed_counts = [0]*10
for number in numbers:
    interval = math.floor(number/13)
    observed_counts[interval] += 1

expected_counts = [50]*10
chi_squared = sum([((observed_counts[i]-expected_counts[i])
                    ** 2)/expected_counts[i] for i in range(10)])
```

PROBLEMAS TERMINAL

TERMINAL

```
500.0
The generated numbers are not consistent with a uniform distribution.

Alienware@DESKTOP-C4AQ6AR MINGW64 ~/Desktop/metodos-y-simulacion/proyecto_p1 (main)
$ python chi2.py
9000
```

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Pregunta 6 12 pts

Generate 500 numbers from the Linear Congruential Generator with parameters: X0 = 7, a = 3, c = 1, m = 127

Run the Chi-square test and Runs test with **α = 0.05** and choose the correct statement about the generated numbers.

- (●) Apparently, they come from the uniform distribution but can't be considered randomly generated.
- ( ) Apparently, they come from the uniform distribution and can be considered randomly generated.
- ( ) Apparently, they don't come from the uniform distribution and can't be considered randomly generated.
- ( ) Apparently, they don't come from the uniform distribution and can be considered randomly generated.

proyecto_p1 > lcg.py > ...

```python
import matplotlib.pyplot as plt

# método lineal congruencial (L.C.G.)
#Linear congruential method: Generate 500 numbers with the following parameters: X0 = 7, a = 3, c = 1, m = 127.
def lcg(seed):
    while True:
        seed = ((3 * seed + 1) % 127)
        yield seed / 100
rand = lcg(7)
values = [next(rand) for _ in range(500)]
print(values)

with open('output.txt', 'w') as f:
    for value in values:
        f.write(format(value))
        f.write('\n')

plt.hist(values, bins=500, edgecolor='k', color = '#0c1881', histtype = 'bar')
plt.show()
```

PROBLEMAS TERMINAL

TERMINAL

```
1, 0.57, 0.45, 0.09, 0.28, 0.85, 0.02, 0.07, 0.22, 0.67, 0.75, 0.99, 0.44, 0.06, 0.19, 0.58, 0.48, 0.18, 0.55, 0.39
, 1.18, 1.01, 0.5, 0.24, 0.73, 0.93, 0.26, 0.79, 1.11, 0.8, 1.14, 0.89, 0.14, 0.43, 0.03, 0.1, 0.31, 0.94, 0.29, 0.
88, 0.11, 0.34, 1.03, 0.56, 0.42, 0.0, 0.01, 0.04, 0.13, 0.4, 1.21, 1.1, 0.77, 1.05, 0.62, 0.6, 0.54, 0.36, 1.09, 0
.74, 0.96, 0.35, 1.06, 0.65, 0.69, 0.81, 1.17, 0.98, 0.41, 1.24, 1.19, 1.04, 0.59, 0.51, 0.27, 0.82, 1.2, 1.07, 0.6
8, 0.78, 1.08, 0.71, 0.87, 0.08, 0.25, 0.76, 1.02, 0.53, 0.33, 1.0, 0.47, 0.15, 0.46, 0.12, 0.37, 1.12, 0.83, 1.23,
 1.16, 0.95, 0.32, 0.97, 0.38, 1.15, 0.92, 0.23, 0.7, 0.84, 1.26, 1.25, 1.22, 1.13, 0.86, 0.05, 0.16, 0.49, 0.21, 0
.64, 0.66, 0.72, 0.9, 0.17, 0.52, 0.3, 0.91, 0.2, 0.61, 0.57, 0.45, 0.09]

Alienware@DESKTOP-C4AQ6AR MINGW64 ~/Desktop/metodos-y-simulacion/proyecto_p1 (main)
```

```python
observed_counts = [0]*10
for number in numbers:
    interval = math.floor(number/13)
    observed_counts[interval] += 1

expected_counts = [50]*10
chi_squared = sum([((observed_counts[i]-expected_counts[i])
                    ** 2)/expected_counts[i] for i in range(10)])

critical_value = 16.92
if chi_squared < critical_value:
    print("The generated numbers are consistent with a uniform distribution.")
```

OBLEMAS TERMINAL

RMINAL

```
, line 7394, in power_divergence
   raise ValueError(msg)
alueError: For each axis slice, the sum of the observed frequencies must agree with the sum
 expected frequencies to a relative tolerance of 1e-08, but the percent differences are:
2.2

lienware@DESKTOP-C4AQ6AR MINGW64 ~/Desktop/metodos-y-simulacion/proyecto_p1 (main)
 python chi2.py
he generated numbers are not consistent with a uniform distribution.

lienware@DESKTOP-C4AQ6AR MINGW64 ~/Desktop/metodos-y-simulacion/proyecto_p1 (main)
```

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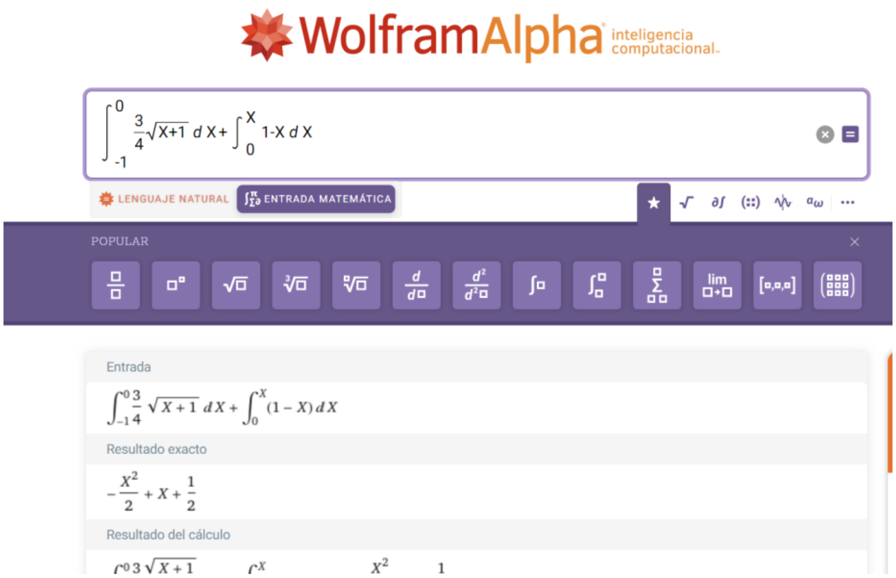
Pregunta 7 14 pts

Given the following pdf:

$$f(x) = \begin{cases} \frac{3}{4}\sqrt{x+1}, & x \in [-1,0) \\ 1-x, & x \in [0,1) \end{cases}$$

Use the inverse method to generate a single random number, using R = 0.57

- ○ 0.0626
- ○ 0.0826
- ○ 0.0526
- ◉ 0.0726



Sustituir R por 0.57

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Pregunta 8 14 pts

Dada la siguiente función de distribución de probabilidad

$f(x) = \frac{1}{x \ln 3}, \ \frac{1}{2} \leq x \leq \frac{3}{2}$

Utiliza el método de la función inversa para generar números aleatorios. Elige el valor más cercano al **valor esperado**.

- (•) 0.9102
- ( ) 5.6879
- ( ) 0.54789
- ( ) 14.9688

◂ Anterior