

Pregunta 1

12 pts

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

$$f(x) = k \cdot \frac{5}{x^2}, 1 < x \leq 3$$

- ☐ 1
- ☐ 3/10
- ☐ 10/3
- ☐ 3/7

$$\int_1^3 \left( \frac{5}{x^2} \right) dx$$

Go

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Solution [Keep Practicing >](#)

Show Steps

$$\int_1^3 \left( \frac{5}{x^2} \right) dx = \frac{10}{3} \quad (\text{Decimal: } 3.33333\dots)$$

Steps

$$\int_1^3 \frac{5}{x^2} dx$$

Take the constant out:  $\int a \cdot f(x) dx = a \cdot \int f(x) dx$

$$= 5 \cdot \int_1^3 \frac{1}{x^2} dx$$

Apply the Power Rule [Show Steps +](#)

$$= 5 \left[ -\frac{1}{x} \right]_1^3$$

Compute the boundaries:  $\frac{2}{3}$  [Show Steps +](#)

$$= 5 \cdot \frac{2}{3}$$

Simplify

$$= \frac{10}{3}$$

Aquí se despeja con K

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)

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

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

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

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



Integral definida

$$\int_0^x \frac{1}{75}x \, dx = \frac{x^2}{150}$$

Integral indefinida

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

Potenciado por WOLFRAM LANGUAGE

Integral definida

$$\int_{10}^x \left( \frac{2}{5} - \frac{2}{75}x \right) dx = -\frac{x^2}{75} + \frac{2x}{5} - \frac{8}{3}$$

Integral indefinida

$$\int \left( \frac{2}{5} - \frac{2x}{75} \right) dx = \frac{2x}{5} - \frac{x^2}{75} + \text{constante}$$

Potenciado por WOLFRAM LANGUAGE

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)?

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

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

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$\frac{d}{dx} \frac{2}{3} x^3$

LENGUAJE NATURAL  $\int_0^x$  ENTRADA MATEMÁTICA

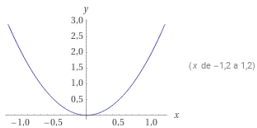
POPULAR

$\frac{d}{dx}$   $\frac{d^2}{dx^2}$   $\sqrt{\quad}$   $\sqrt[3]{\quad}$   $\sqrt[n]{\quad}$   $\int$   $\int^{\quad}$   $\sum$   $\lim$   $[\quad, \quad]$   $\left( \begin{smallmatrix} \square & \square & \square \\ \square & \square & \square \end{smallmatrix} \right)$

Derivada Solución paso a paso

$\frac{d}{dx} \left( \frac{2x^3}{3} \right) = 2x^2$

Representación gráfica



$\frac{d}{dx} \left( -\frac{2}{3} x^3 + 2x^2 - x \right)$

LENGUAJE NATURAL  $\int_0^x$  ENTRADA MATEMÁTICA

POPULAR

$\frac{d}{dx}$   $\frac{d^2}{dx^2}$   $\sqrt{\quad}$   $\sqrt[3]{\quad}$   $\sqrt[n]{\quad}$   $\int$   $\int^{\quad}$   $\sum$   $\lim$   $[\quad, \quad]$   $\left( \begin{smallmatrix} \square & \square & \square \\ \square & \square & \square \end{smallmatrix} \right)$

Derivada Solución paso a paso

$\frac{d}{dx} \left( -\frac{2x^3}{3} + 2x^2 - x \right) = -2x^2 + 4x - 1$

Representación gráfica



#### Pregunta 4

12 pts

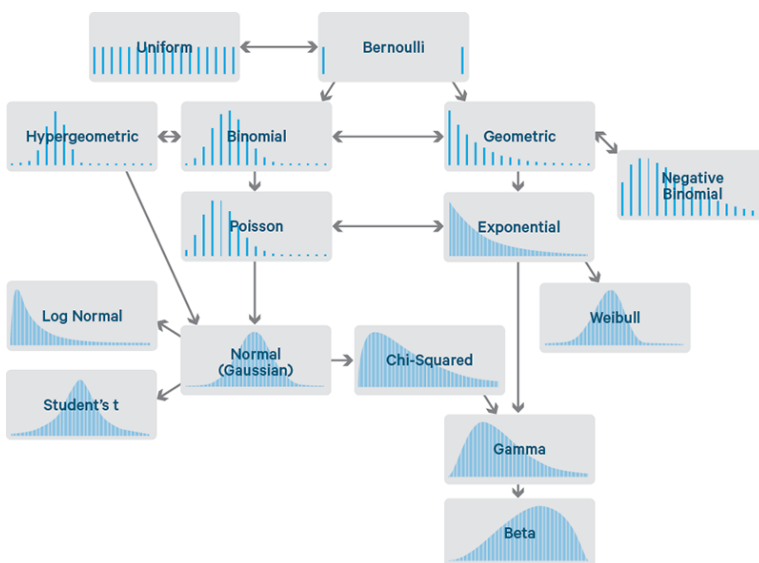
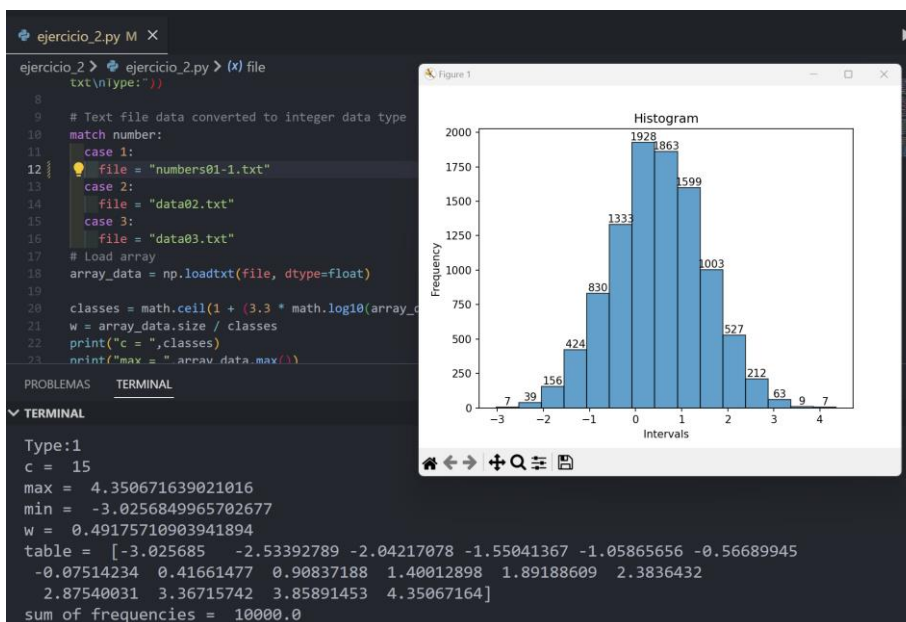
Load the following data set [numbers01-1.txt](#) ↓

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

- ☐ Exponential
- ☐ Uniform
- ☐ Normal

◀ Anterior

Siguiente ▶



### Pregunta 5

12 pts

Using the Linear Congruential Method, generate 1000 numbers with the following parameters:  $X_0 = 88$ ,  $a = 50$ ,  $c = 2$ ,  $m = 100$

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

- ☐ 900
- ☐ 9
- ☐ 90
- ☒ 9000

```
import matplotlib.pyplot as plt

# método lineal congruencial (L.C.G.)
#linear congruential method: Generate 1000 numbers with the following
parameters: X0 = 88, a = 50, c = 2, m = 100.

def lcg(seed):
    while True:
        seed = (50 * seed + 2) % 100
        yield seed / 100

rand = lcg(88)
values = [next(rand) for _ in range(100)]
print(values)

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

plt.hist(values, bins=1000, edgecolor='k', color = '#0c1881', histtype = 'bar')
plt.show()
```

```
oyecto_p1 > chi2.py > ...
6     for i in range(1000):
7         X0 = (a*X0 + c) % m
8         numbers.append(X0/m)
9
10    observed_counts = [0]*10
11    expected_counts = [100]*10
12    for number in numbers:
13        interval = int(number/0.10)
14        observed_counts[interval] += 1
15
16    chi_squared = sum([(observed_counts[i]-expected_counts[i])
17        ** 2)/expected_counts[i] for i in range(10)])
18    print(chi_squared)
```



## Pregunta 6

12 pts

Generate 500 numbers from the Linear Congruential Generator with parameters:  $X_0 = 7$ ,  $a = 3$ ,  $c = 1$ ,  $m = 127$

Run the Chi-square test and Runs test with  $\alpha = 0.05$  and choose the correct statement about the generated numbers.

```
proyecto_p1 > lcg.py > ...
1 import matplotlib.pyplot as plt
2
3 # método lineal congruencial (L.C.G.)
4 #Linear congruential method: Generate 500 numbers with the following
5 parameters: X0 = 7, a = 3, c = 1, m = 127.
6 def lcg(seed):
7     while True:
8         seed = ((3 * seed + 1) % 127)
9         yield seed / 100
10    rand = lcg(7)
11    values = [next(rand) for _ in range(500)]
12    print(values)
13
14    with open('output.txt', 'w') as f:
15        for value in values:
16            f.write(format(value))
17            f.write('\n')
18
19    plt.hist(values, bins=500, edgecolor='k', color = '#0c1881', histtype = 'bar')
20    plt.show()
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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  $R = 0.97$

☐ 0.8551

☐ 0.7551

☐ 0.6551

☐ 0.5551

◀ Anterior

Siguiente ▶

WolframAlpha computacional.

$$\int_{-1}^x \frac{3}{4}\sqrt{x+1} dx + \int_0^x 1-x dx$$

LENGUAJE NATURAL

ENTRADA MATEMÁTICA

★ √ ∂f (::) ∇ ∞ ...

POPULAR

$\frac{a}{b}$   $a^b$   $\sqrt{a}$   $\sqrt[n]{a}$   $\sqrt[n]{a}$   $\frac{d}{da}$   $\frac{d^2}{da^2}$   $\int a$   $\int_a^b$   $\sum$   $\lim_{a \rightarrow b}$   $[a, b]$   $\left( \begin{smallmatrix} a & b \\ c & d \end{smallmatrix} \right)$

Entrada

$$\int_{-1}^x \frac{3}{4}\sqrt{x+1} dx + \int_0^x (1-x) dx$$

Resultado

$$-\frac{x^2}{2} + x + \frac{1}{2}(x+1)^{3/2}$$

Resultado del cálculo

$$\int_{-1}^x \frac{3}{4}\sqrt{x+1} dx + \int_0^x (1-x) dx = \frac{1}{2}(-x^2 + 2x + (x+1)^{3/2})$$

WolframAlpha computacional.

resolver  $x$ ,  $R = x - x^{2/2} + (1+x)^{3/2}$

LENGUAJE NATURAL

ENTRADA MATEMÁTICA

★ √ ∂f (::) ∇ ∞ ...

POPULAR

$\frac{a}{b}$   $a^b$   $\sqrt{a}$   $\sqrt[n]{a}$   $\sqrt[n]{a}$   $\frac{d}{da}$   $\frac{d^2}{da^2}$   $\int a$   $\int_a^b$   $\sum$   $\lim_{a \rightarrow b}$   $[a, b]$   $\left( \begin{smallmatrix} a & b \\ c & d \end{smallmatrix} \right)$

Interpretación de la entrada

resuelve  $R = x - x^{2/2} + (1+x)^{3/2}$  para  $x$

Resultado

$$x = R^{4/3} - 1$$

✓ Solución paso a paso

Potenciado por WOLFRAM LANGUAGE

Pregunta 8

14 pts

Dada la siguiente función de distribución de probabilidad

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

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

- ☐ 5.6879
- ☐ 0.54789
- ☒ 0.9102
- ☐ 14.9688

The screenshot shows the WolframAlpha interface. At the top, the WolframAlpha logo is displayed with the tagline "inteligencia computacional". Below the logo, the input field contains the integral  $\int_{\frac{1}{2}}^{\frac{3}{2}} \frac{1}{x \ln(3)} dx$ . Below the input field, there is a row of buttons for "LENGUAJE NATURAL" and "ENTRADA MATEMÁTICA". Below this, there is a row of buttons for various mathematical operations:  $\frac{d}{dx}$ ,  $\frac{d^2}{dx^2}$ ,  $\int$ ,  $\int_0^x$ ,  $\sum$ ,  $\lim$ ,  $[a, b]$ , and  $\frac{a}{b}$ . Below the buttons, the result of the integral is displayed:  $\int_{\frac{1}{2}}^{\frac{3}{2}} \frac{1}{x \ln(3)} dx = \frac{\log(2x)}{\log(3)}$  with the condition  $\text{DATA } \text{Re}(x) > 0 \vee x \notin \mathbb{R}$ . Below the result, there are several lines of text explaining the notation:  $\log(x)$  es el logaritmo natural,  $\text{Re}(z)$  es la parte real de  $z$ ,  $e_1 \vee e_2 \vee \dots$  es la función lógica de disyunción (OR), and  $\mathbb{R}$  es el conjunto de los números reales.



Daniel Cu  
A01703613

resolver x,  $R = \frac{\log(2x)}{\log(3)}$

LENGUAJE NATURAL  $\int_0^1$  ENTRADA MATEMÁTICA

★  $\sqrt{\phantom{x}}$   $\partial f$   $(z)$   $\sqrt[n]{\phantom{x}}$   $a_\omega$  ...

POPULAR ×

$\frac{\square}{\square}$   $\square^\square$   $\sqrt{\square}$   $\sqrt[3]{\square}$   $\sqrt[n]{\square}$   $\frac{d}{d\square}$   $\frac{d^2}{d^2\square}$   $\int \square$   $\int \square$   $\sum \square$   $\lim_{\square \rightarrow \square}$   $[\square, \square]$   $\left( \begin{smallmatrix} \square & \square \\ \square & \square \end{smallmatrix} \right)$

Se asume que "log" es el logaritmo natural | Alternativa: el logaritmo de base 10

Interpretación de la entrada

resuelve

$R = \frac{\log(2x)}{\log(3)}$

para

$x$

log(x) es el logaritmo natural

Resultado Forma aproximada

$$x = \frac{3^R}{2} \text{ y } -\frac{\pi}{\log(3)} < \text{Im}(R) \leq \frac{\pi}{\log(3)}$$

Im(z) es la parte imaginaria de z

Solución sobre los reales ☒ Solución paso a paso

$$x = \frac{3^R}{2}$$

Despejar R