2. Concept Check: Hypothesis Test Using a Single Observation

Setup:

Let X be a **single** (i.e. $n = 1$) Gaussian random variable with unknown mean μ and variance 1. Consider the following hypotheses:

$$H_0 : \mu = 0 \quad \text{vs} \quad H_1 : \mu \neq 0.$$

(a)

1/1 point (graded)

Define a test $\psi_\alpha : \mathbb{R} \to \{0, 1\}$ with level α that is of the form

$$\psi_\alpha = \mathbf{1}\{f_\alpha(X) > 0\},$$

for some function $f_\alpha : \mathbb{R} \to \mathbb{R}$.

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ur test ψ above to satisfy the following:

- **symmetric** in the value of X
- its “acceptance region" is an interval. (The **acceptance region** of a test is the region in which the null hypothesis is **not rejected**, i.e. the complement of its rejection region.)

Specify the function $f_\alpha(X)$ in terms of α below.

(Type **alpha** for α. If applicable, enter **abs(x)** for $|x|$, **Phi(x)** for $\Phi(x) = \mathbf{P}(Z \leq x)$ where $Z \sim \mathcal{N}(0,1)$, and **q(alpha)** for q_α, the $1-\alpha$-quantile of a standard normal distribution, e.g. enter **q(0.01)** for $q_{0.01}$.)

$f(X) =$ abs(X)-q(alpha/2) ✔

STANDARD NOTATION

Submit You have used 2 of 3 attempts

✔ Correct (1/1 point)

(b)

3/3 points (graded)

Assume you observe $X = 1.32$, and What is the value of your test ψ_α with level $\alpha = 0.05$?

$\psi(X) =$ 0 ✔

What is the p-value of your test (keeping in mind the symmetry and interval requirements)?
(If applicable, enter **abs(x)** for $|x|$, **Phi(x)** for $\Phi(x) = \mathbf{P}(Z \leq x)$ where $Z \sim \mathcal{N}(0,1)$, and **q(alpha)** for q_α, the $1-\alpha$-quantile of a standard normal distribution, e.g. enter **q(0.01)** for $q_{0.01}$.)

p-value $=$ 0.18683501798694357 ✔

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What is the conclusion of the test?

- Accept H_0
- Do not reject H_0
- Accept H_1
- Do not reject H_1

✔

STANDARD NOTATION

Submit You have used 1 of 3 attempts

✔ Correct (3/3 points)

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Not able to figure out (a) 3

I have tried a bunch of functions that similar to |A| - |X|, which is symmetric around 0. But the grader keeps telling that the answer is incorrect. Can someone please help m...

[Staff] **SPOILER Q1** The first question is bugged 22

I'm pretty sure that I have answered in the correct way but the grader give me 0 points! My answer is: --- edited ---

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