



[Course](#) > [Unit 4 Hypothesis testing](#) > [Homework 8](#) > 3. QQ Plots

3. QQ Plots

Consider an iid sample $X_1, X_2, \dots, X_n \stackrel{iid}{\sim} \mathbf{P}$ that has been reordered as $X_{(1)} \leq X_{(2)} \leq \dots \leq X_{(n)}$ where n is very large. In the problems below, we have chosen a different distribution for \mathbf{P} and compared the empirical quantiles to the standard Gaussian quantiles using a QQ plot. Recall that

- the **Laplace distribution** $\text{Lap}(\lambda)$ with parameter $\lambda > 0$ is the continuous probability distribution with density $f_\lambda = \frac{\lambda}{2} e^{-\lambda|x|}$, and
- the **Cauchy distribution** is the continuous probability distribution with density $g(x) = \frac{1}{\pi} \frac{1}{1+x^2}$.

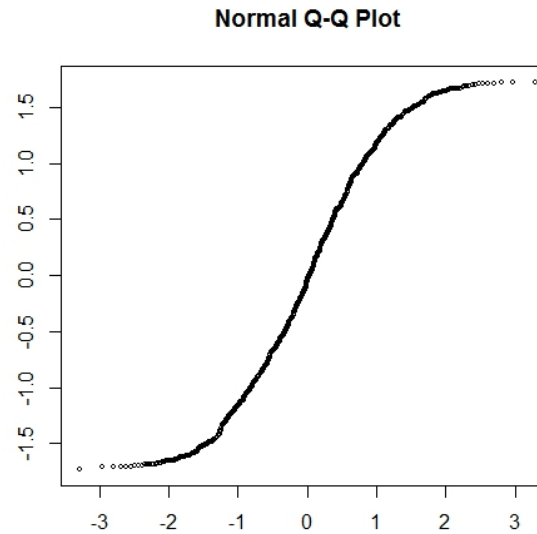
(These were also introduced in Lecture 12.)

For each plot below, match the QQ plot with the correct distribution for \mathbf{P} . *Hint:* Each possible distribution will be an answer choice exactly once, so you should use the process of elimination.

Hint: You may use computational tools to graph the pdf of the possible distributions of \mathbf{P} .

Matching a Distribution to a QQ Plot I

1/1 point (graded)



☐ Standard normal: $N(0, 1)$

☐ Cauchy distribution

☐ Exponential with parameter 1: $\text{Exp}(1)$

☒ Uniform on the interval $[-\sqrt{3}, \sqrt{3}]$: $\text{Unif}[-\sqrt{3}, \sqrt{3}]$

☐ Laplace distribution with parameter $\sqrt{2}$: $\text{Lap}(\sqrt{2})$



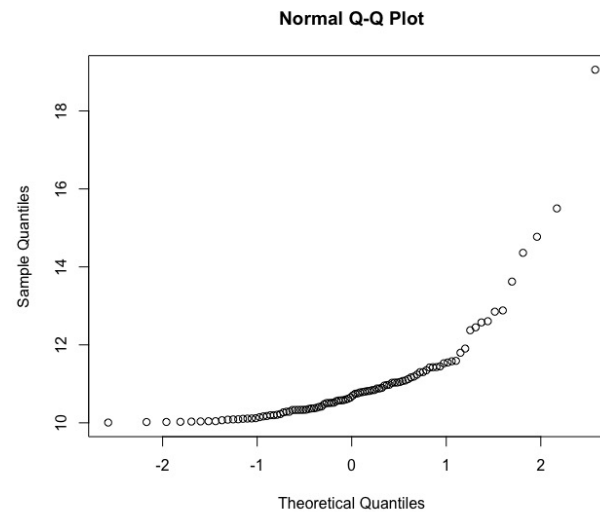
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✓ Correct (1/1 point)

Matching a Distribution to a QQ Plot II

1/1 point (graded)



☐ Standard normal: $N(0, 1)$

☐ Cauchy distribution

☒ Shifted exponential with parameter 2.5: $\text{Exp}(2.5) + c$ for some $c > 0$

☐ Uniform on the interval $[-\sqrt{3}, \sqrt{3}]$: $\text{Unif}[-\sqrt{3}, \sqrt{3}]$

☐ Laplace distribution with parameter $\sqrt{2}$: $\text{Lap}(\sqrt{2})$



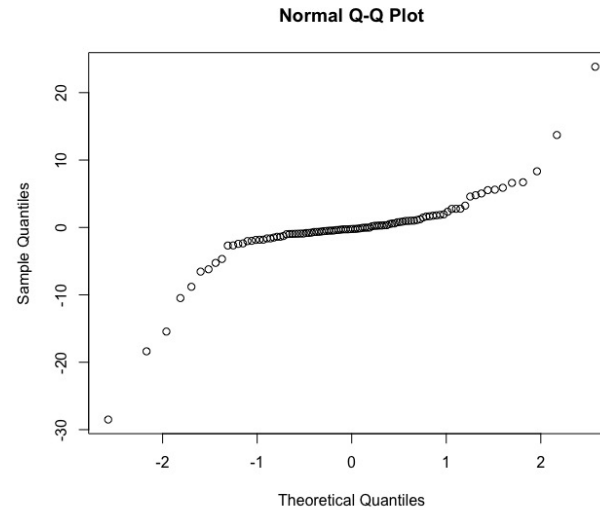
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Matching a Distribution to a QQ Plot III

1/1 point (graded)



☐ Standard normal: $N(0, 1)$

☒ Cauchy distribution

☐ Exponential with parameter 1: $\text{Exp}(1)$

☐ Uniform on the interval $[-\sqrt{3}, \sqrt{3}]$: $\text{Unif}[-\sqrt{3}, \sqrt{3}]$

☐ Laplace distribution with parameter $\sqrt{2}$: $\text{Lap}(\sqrt{2})$



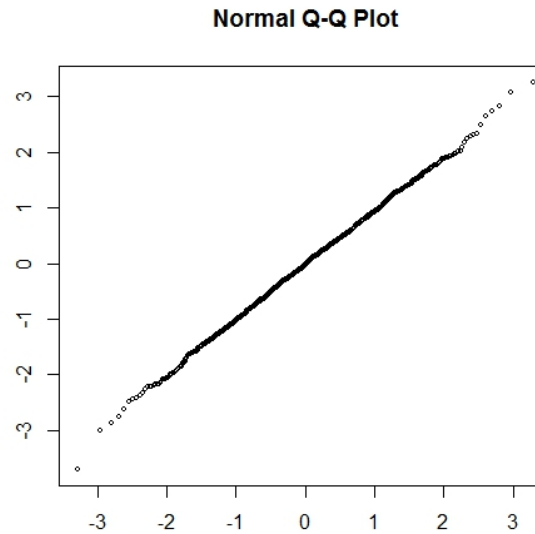
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✓ Correct (1/1 point)

Matching a Distribution to a QQ Plot IV

1/1 point (graded)



☒ Standard normal: $N(0, 1)$

☐ Cauchy distribution

☐ Exponential with parameter 1: $\text{Exp}(1)$

☐ Uniform on the interval $[-\sqrt{3}, \sqrt{3}]$: $\text{Unif}[-\sqrt{3}, \sqrt{3}]$

☐ Laplace distribution with parameter $\sqrt{2}$: $\text{Lap}(\sqrt{2})$



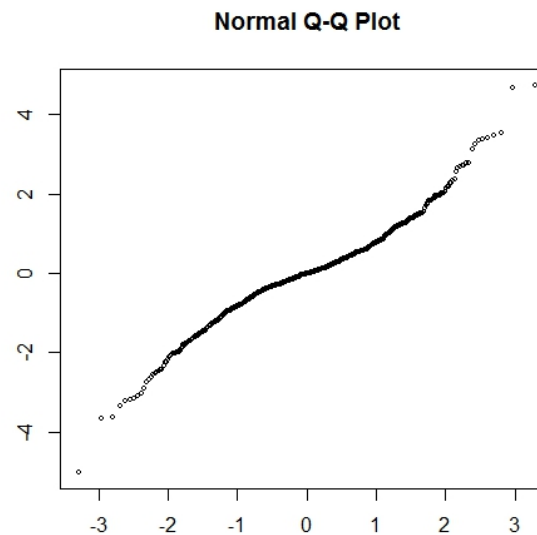
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You have used 1 of 2 attempts

✓ Correct (1/1 point)

Matching a Distribution to a QQ Plot V

1/1 point (graded)



☐ Standard normal: $N(0, 1)$

☐ Cauchy distribution

☐ Exponential with parameter 1: $\text{Exp}(1)$

☐ Uniform on the interval $[-\sqrt{3}, \sqrt{3}]$: $\text{Unif}[-\sqrt{3}, \sqrt{3}]$

☒ Laplace distribution with parameter $\sqrt{2}$: $\text{Lap}(\sqrt{2})$



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