You are a wildlife biologist analyzing the annual number of lynx trapped in Canada from 1821 to 1934. The goal is to identify dominant frequencies in the data using a periodogram and then fit an autoregressive (AR) model to the data.

### Using the lynx Dataset

### Explanation:

**Load the Dataset:**

* 1. data("lynx"): This command loads the lynx dataset, which is a time series object in R.

**Plot the Time Series:**

* 1. plot(lynx, ...): This command plots the original time series data, showing the annual number of lynx trapped.

**Compute the Periodogram:**

* 1. spec.pgram(lynx, log = "no", plot = FALSE): This command computes the periodogram of the lynx time series without plotting it immediately.

**Plot the Periodogram:**

* 1. plot(lynx\_periodogram, ...): This command plots the periodogram, showing the spectral density against frequency.

**Fit an AR Model:**

* 1. ar(lynx): This command fits an autoregressive model to the lynx data.

**Print AR Model Summary:**

* 1. summary(lynx\_ar\_model): This command prints the summary of the fitted AR model, including the AR coefficients.

**Predict Using the AR Model:**

* 1. predict(lynx\_ar\_model, n.ahead = length(lynx))$pred: This command generates the fitted values using the AR model.

**Plot Fitted Values:**

* 1. lines(lynx\_fitted\_values, col = "red"): This command adds the fitted values to the plot of the original data.

### Interpretation:

* The periodogram will help identify the dominant frequencies in the lynx trapping data.
* The fitted AR model provides a statistical model of the data, capturing the temporal dependencies and providing predictions.

You are tasked with analyzing the autoregressive properties of the AirPassengers dataset. The goal is to fit an AR model to the data and then construct and interpret the periodogram of the AR model.

### Using the AirPassengers Dataset for AR Analysis

1. **Load and Visualize the Dataset:**
2. **Fit an AR Model:**
3. **Compute and Plot the Periodogram of the Residuals:**

**Load and Visualize the Dataset:**

* 1. data("AirPassengers"): Loads the AirPassengers dataset.
  2. plot(AirPassengers, ...): Plots the original time series data.

**Fit an AR Model:**

* 1. auto.arima(AirPassengers, d = 0, seasonal = FALSE): Automatically fits the best AR model to the data by setting d = 0 to ensure it is an AR model and not an ARIMA model.
  2. summary(ar\_model): Prints the summary of the fitted AR model, which includes the coefficients and diagnostic information.

**Compute and Plot the Periodogram of the Residuals:**

* 1. residuals(ar\_model): Extracts the residuals from the fitted AR model.
  2. plot(residuals\_ar, ...): Plots the residuals to visually inspect them.
  3. spec.pgram(residuals\_ar, log = "no", plot = FALSE): Computes the periodogram of the residuals without logging the spectral density.
  4. plot(periodogram\_residuals, ...): Plots the periodogram of the residuals.

### Interpretation:

* **Original Time Series Plot:** Shows the monthly airline passenger numbers, which typically have a clear seasonal pattern.
* **Residuals Plot:** Shows the residuals of the AR model, which should ideally look like white noise if the model fits well.
* **Periodogram Plot of Residuals:** The periodogram of the residuals helps in identifying any remaining periodic patterns in the data that the AR model might not have captured. If the AR model fits well, the periodogram of the residuals should not show significant peaks.