⭐ 1. Import Required Libraries

```
import numpy as np
import pandas as pd
from sklearn.linear_model import LinearRegression, RidgeCV, LassoCV
from sklearn.metrics import mean_squared_error, mean_absolute_error, r2_score
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split
```

⭐ 2. Load Your Dataset

(Replace with your dataset)

```
df = pd.read_csv("yourfile.csv")

X = df.drop("target", axis=1)
y = df["target"]
```

⭐ 3. Train–Test Split

```
X_train, X_test, y_train, y_test = train_test_split(
    X, y, test_size=0.2, random_state=42
)
```

⭐ 4. Normalize Features (VERY IMPORTANT for Ridge/Lasso)

```
scaler = StandardScaler()
X_train_scaled = scaler.fit_transform(X_train)
X_test_scaled = scaler.transform(X_test)
```

⭐ 5. Train All Three Models

✔️ Linear Regression

```
lin = LinearRegression()
lin.fit(X_train_scaled, y_train)
```

✔️ Ridge with Cross Validation (auto alpha)

```
ridge = RidgeCV(alphas=np.logspace(-3, 3, 50))
ridge.fit(X_train_scaled, y_train)
```

✔️ Lasso with Cross Validation (auto alpha)

```
lasso = LassoCV(cv=5, random_state=42)
lasso.fit(X_train_scaled, y_train)
```

⭐ 6. Predictions

```
y_pred_lin = lin.predict(X_train_scaled)
y_pred_ridge = ridge.predict(X_train_scaled)
y_pred_lasso = lasso.predict(X_train_scaled)
```

⭐ 7. Evaluation Function

```
def evaluate(true, pred, model_name):
    print(f"\n====== {model_name} ======")
    print("R2 Score:", r2_score(true, pred))
    print("MAE:", mean_absolute_error(true, pred))
    print("RMSE:", np.sqrt(mean_squared_error(true, pred)))
```

⭐ 8. Compare All Models (Train Performance)

```
evaluate(y_train, y_pred_lin, "Linear Regression")
evaluate(y_train, y_pred_ridge, "Ridge Regression")
evaluate(y_train, y_pred_lasso, "Lasso Regression")
```

Do the same for **test data**:

```
evaluate(y_test, lin.predict(X_test_scaled), "Linear Regression (Test)")
evaluate(y_test, ridge.predict(X_test_scaled), "Ridge Regression (Test)")
evaluate(y_test, lasso.predict(X_test_scaled), "Lasso Regression (Test)")
```

⭐ 9. Compare Coefficients (Very Important)

✔️ Linear Regression Coefficients

```
print("Linear:", lin.coef_)
```

✔️ Ridge Coefficients

```
print("Ridge:", ridge.coef_)
```

✔️ Lasso Coefficients

```
print("Lasso:", lasso.coef_)
```

🔥 Interpretation:

- **Large coefficients** → Linear Regression (can overfit)
- **Smaller coefficients** → Ridge (shrinks but doesn’t remove)
- **Zero coefficients** → Lasso (feature selection)

⭐ 10. Check Which Features Lasso Removed

```
lasso_coeffs = pd.Series(lasso.coef_, index=X.columns)
print(lasso_coeffs[lasso_coeffs == 0])
```

This shows **all features Lasso dropped**.

⭐ 11. Final Decision Logic

Model	Use When	Behavior
Linear Regression	data is clean, not many features	may overfit
Ridge	many correlated variables	shrinks coefficients
Lasso	want feature selection	forces some coefficients to 0