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# plasma_simulation_tokamak.py
# Simplified Plasma Temperature Simulation in a Tokamak
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"""
This script demonstrates a simplified numerical model of plasma temperature
evolution in a tokamak reactor.

Model assumption:
The temperature follows a simplified energy loss equation:

    dT/dt = -kT

with analytical solution:

    T(t) = T0 * exp(-k t)

This example illustrates numerical modeling and scientific visualization
relevant to computational physics applications.
"""

import numpy as np
import matplotlib.pyplot as plt

# Time array (0 to 10 seconds)
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```
t = np.linspace(0, 10, 500)


# Parameters
T0 = 100         # Initial plasma temperature (arbitrary units)
k = 0.3          # Simplified energy loss coefficient


# Temperature evolution
T = T0 * np.exp(-k * t)


# Plot
plt.figure(figsize=(8,5))
plt.plot(t, T, linewidth=2)
plt.xlabel("Time (s)")
plt.ylabel("Plasma Temperature (a.u.)")
plt.title("Simplified Plasma Temperature Evolution in a Tokamak")
plt.grid(True)
plt.show()
```