№1

Invalid Date

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$$\frac{du}{dt} = \alpha u, \quad u(0) = u_0$$

: - u — , - t — , - α — .

2

2.1

“‘julia using DrWatson @quickactivate “project” using DifferentialEquations using Plots using DataFrames using JLD2

3

function exponential_growth!(du, u, p, t) = p du[1] = * u[1] end

4

u0 = [1.0] = 0.3 tspan = (0.0, 10.0)

prob = ODEProblem(exponential_growth!, u0, tspan,) sol = solve(prob, Tsit5(), saveat=0.1)

5

df = DataFrame(t=sol.t, u=first.(sol.u)) first(df, 5) doubling_time = log(2) / println(“ :”, round(doubling_time, digits=2))

6

alpha_values = [0.1, 0.3, 0.5, 0.8, 1.0] results = []

for in alpha_values prob = ODEProblem(exponential_growth!, [1.0], (0.0, 10.0),) sol = solve(prob, Tsit5(), saveat=0.1)

```
final_pop = last(sol.u)[1]
doubling = log(2) /

push!(results, ( = , final_population=final_pop, doubling_time=doubling))
```

end

results_df = DataFrame(results) results_df

7

7.1

“‘julia using DrWatson @quickactivate “project” using DifferentialEquations, DataFrames, Plots, JLD2, BenchmarkTools

function exponential_growth!(du, u, p, t) = p. du[1] = * u[1] end

8

base_params = Dict(:u0 => [1.0], : => 0.3, :tspan => (0.0, 10.0), :solver => Tsit5(), :saveat => 0.1)

9

param_grid = Dict(: => [0.1, 0.3, 0.5, 0.8, 1.0])

10

results = [] for in param_grid[:] prob = ODEProblem(exponential_growth!, [1.0], (0.0, 10.0), (= ,)) sol = solve(prob, Tsit5(), saveat=0.1) push!(results, (= , final=last(sol.u)[1], doubling=log(2)/)) end

DataFrame(results)

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