

DiffEqSolutions

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1 DiffEq Solutions

1.1 Solution to the Lorenz Problem

```
In [1]: using DifferentialEquations
```

```
f = @ode_def_nohes LorenzExample begin
    dx =  $\sigma(y-x)$ 
    dy =  $x(\rho-z) - y$ 
    dz =  $x*y - \beta*z$ 
end  $\sigma \Rightarrow 10.0$   $\rho \Rightarrow 28.0$   $\beta \Rightarrow 2.6666$ 

u0 = big([0.1;0.0;0.0])
tspan = (big(0.0),big(100.0))
prob = ODEProblem(f,u0,tspan)
sol = solve(prob);
```

```
In [2]: using Plots; gr(); plot(sol)
```

```
In [3]: plot(sol,vars=(:x,:y,:z))
```

1.2 Solution to the Ball Bounce Problem

```
In [4]: f = function (t,u,du)
```

```
    du[1] = u[2]
    du[2] = -9.81
```

```
end
```

```
condition = function (t,u,integrator) # Event when event_f(t,u,k) == 0
    u[1]
```

```
end
```

```
affect! = nothing
```

```
affect_neg! = function (integrator)
```

```
    integrator.u[2] = -0.8integrator.u[2]
```

```
end
```

```
callback = ContinuousCallback(condition,affect!,affect_neg!,interp_points=1000)
```

```
u0 = [50.0,0.0]
tspan = (0.0,15.0)
prob = ODEProblem(f,u0,tspan)

sol = solve(prob,Tsit5(),callback=callback,adaptive=false,dt=1/4)
plot(sol)
```