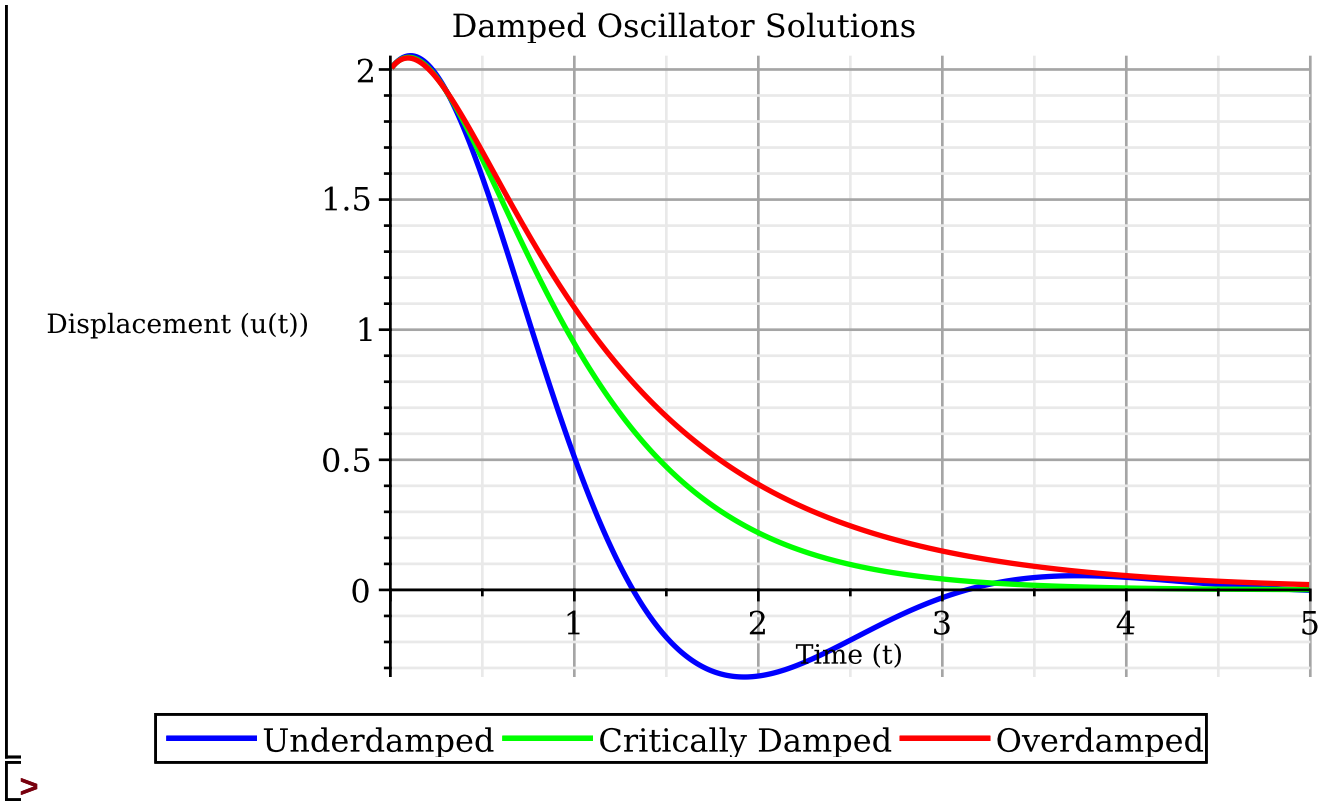
```
> restart;

  # Parameters
  k := 4:
  u0 := 2:
  v0 := 1:

  # Time range
  t_range := 0..5:

  # Underdamped case (gamma^2 < 4k)
  gamma1 := 2:
  omega := sqrt(4*k - gamma1^2)/2:
  u_underdamped := u0*exp(-gamma1*t/2)*cos(omega*t) +
                   (v0 + (gamma1/2)*u0)*exp(-gamma1*t/2)*sin(omega*t)
                   /omega:

  # Critically damped case (gamma^2 = 4k)
  gamma2 := 2*sqrt(k):
  u_critical := (u0 + (v0 + gamma2*u0/2)*t)*exp(-gamma2*t/2):

  # Overdamped case (gamma^2 > 4k)
  gamma3 := 5:
  r1 := (-gamma3 - sqrt(gamma3^2 - 4*k))/2:
  r2 := (-gamma3 + sqrt(gamma3^2 - 4*k))/2:
  u_overdamped := ((u0*r2 - v0)/(r2 - r1))*exp(r1*t) +
                  ((v0 - u0*r1)/(r2 - r1))*exp(r2*t):

  # Plot the three cases
  plots[display](
    [plot(u_underdamped, t = t_range, color = blue, thickness = 2, legend
      = "Underdamped"),
     plot(u_critical, t = t_range, color = green, thickness = 2, legend
      = "Critically Damped"),
     plot(u_overdamped, t = t_range, color = red, thickness = 2, legend
      = "Overdamped")],
    title = "Damped Oscillator Solutions",
    labels = ["Time (t)", "Displacement (u(t))"],
    gridlines = true
  );
```


Damped Oscillator Solutions
Displacement (u(t))
Time (t)
2
1.5
1
0.5
0
1
2
3
4
5
Underdamped
Critically Damped
Overdamped