In[30]:=
```
(*PROBLEMA 1 DEL SIMULACRO*)
(*La solución es:*)
sistema1 = {x''[t] + x[t] - y''[t] - y[t] == -t, 2 x'[t] - y'[t] - y[t] == 0};
condicion1 = {x[0] == 0, x'[0] == 1, y[0] == 1, y'[0] == 1};

Solucion1 = DSolve[{sistema1, condicion1}, {x[t], y[t]}, t];
xSol1 = x[t] /. Solucion1[[1]];
ySol1 = y[t] /. Solucion1[[1]];
Simplify[xSol1]
Simplify[ySol1]
```

Out[35]= $-2 + e^{t} - t + \text{Cos}[t] + \text{Sin}[t]$

Out[36]= $-2 + e^{t} + 2\,\text{Cos}[t]$

In[37]:=
```
(*PROBLEMA PROPUESTO 3.1.1 :*)
(*La solución es*)

sistema2 = {x'[t] == 4 x[t], y'[t] == 2 x[t] + 2 y[t] - z[t], z'[t] == y[t] + x[t] - t};
Solucion2 = DSolve[sistema2, {x[t], y[t], z[t]}, t];
Xsol2 = x[t] /. Solucion2[[1]];
Ysol2 = y[t] /. Solucion2[[1]];
Zsol2 = z[t] /. Solucion2[[1]];
Simplify[Xsol2]
Simplify[Ysol2]
Simplify[Zsol2]
```

Out[42]= $e^{4t}\,C_1$

Out[43]= $2 + t + \frac{7}{9}\,e^{4t}\,C_1 + e^{t}\left(-\frac{7\,C_1}{9} + C_2\right) - \frac{1}{3}\,e^{t}\,t\,(C_1 - 3\,C_2 + 3\,C_3)$

Out[44]= $3 + 2\,t + \frac{4}{9}\,e^{4t}\,C_1 + e^{t}\left(-\frac{4\,C_1}{9} + C_3\right) - \frac{1}{3}\,e^{t}\,t\,(C_1 - 3\,C_2 + 3\,C_3)$

In[45]:=
```
(*PROBLEMA PROPUESTO 3.1.2*)
(*La solución es:*)
sistema4 = {x''[t] + x[t] - y''[t] - y[t] == -2 Cos[2 t],
   2 x'[t] - y'[t] - y[t] == 0};
Solucion4 = DSolve[sistema4, {x[t], y[t]}, t];
xSol2 = x[t] /. Solucion4[[1]];
ySol2 = y[t] /. Solucion4[[1]];
Simplify[xSol2]
Simplify[ySol2]
```

Out[49]=
$$\frac{1}{1875}\left(1875\, e^{t} c_1 - 1875\, e^{t} c_2 - 3\,(24\, c_1 + 7\, c_2 - 24\, c_3)\,\text{Cos}[t] - 750\,\text{Cos}[2t] + 21\, c_1\,\text{Sin}[t] - 72\, c_2\,\text{Sin}[t] - 21\, c_3\,\text{Sin}[t] - 1000\,\text{Sin}[2t]\right)$$

Out[50]=
$$\frac{1}{1875}\left(1875\, e^{t} c_1 - 1875\, e^{t} c_2 + (-51\, c_1 - 93\, c_2 + 51\, c_3)\,\text{Cos}[t] - 2000\,\text{Cos}[2t] + 93\, c_1\,\text{Sin}[t] - 51\, c_2\,\text{Sin}[t] - 93\, c_3\,\text{Sin}[t] - 1000\,\text{Sin}[2t]\right)$$

In[51]:=
```
(*Problema 2 DEL SIMULACRO:*)
sistema3 =
  {x'[t] == 2 x[t] - 7 y[t], y'[t] == 5 x[t] + 10 y[t] + 4 z[t], z'[t] == 5 y[t] + 2 z[t]};
Solucion3 = DSolve[sistema3, {x[t], y[t], z[t]}, t];
Xsol3 = x[t] /. Solucion3[[1]];
Ysol3 = y[t] /. Solucion3[[1]];
Zsol3 = z[t] /. Solucion3[[1]];
Simplify[Xsol3]
Simplify[Ysol3]
Simplify[Zsol3]
```

Out[56]=
$$-\frac{1}{30} e^{2t}\left(5\left(8 - 35\, e^{3t} + 21\, e^{5t}\right) c_1 + 7\left(8\, c_3 - 5\, e^{3t}\,(3\, c_2 + 4\, c_3) + 3\, e^{5t}\,(5\, c_2 + 4\, c_3)\right)\right)$$

Out[57]=
$$\frac{1}{2} e^{5t}\left(5\left(-1 + e^{2t}\right) c_1 + \left(-3 + 5\, e^{2t}\right) c_2 + 4\left(-1 + e^{2t}\right) c_3\right)$$

Out[58]=
$$\frac{1}{6} e^{2t}\left(5\left(2 - 5\, e^{3t} + 3\, e^{5t}\right) c_1 + 14\, c_3 - 5\, e^{3t}\,(3\, c_2 + 4\, c_3) + 3\, e^{5t}\,(5\, c_2 + 4\, c_3)\right)$$