

> with(inttrans) :

> laplace(sin(4*t), t, s);

$$\frac{4}{s^2 + 16} \quad (1)$$

> laplace(diff(y(t), t) = 3*y(t) + exp(-t), t, s);

$$s \text{laplace}(y(t), t, s) - y(0) = 3 \text{laplace}(y(t), t, s) + \frac{1}{s+1} \quad (2)$$

> solve(%, laplace(y(t), t, s));

$$\frac{y(0) s + y(0) + 1}{(s+1) (-3+s)} \quad (3)$$

> invlaplace(%, s, t);

$$-\frac{e^{-t}}{4} + \frac{e^{3t} (4 y(0) + 1)}{4} \quad (4)$$

> de1 := diff(y1(t), t) = -4*y1(t) - y2(t) + 2*exp(t);

de2 := diff(y2(t), t) = y1(t) - 2*y2(t) + sin(2*t);

$$de1 := \frac{d}{dt} y1(t) = -4 y1(t) - y2(t) + 2 e^t$$

$$de2 := \frac{d}{dt} y2(t) = y1(t) - 2 y2(t) + \sin(2 t) \quad (5)$$

> eq1 := laplace(de1, t, s);

$$eq1 := s \text{laplace}(y1(t), t, s) - y1(0) = -4 \text{laplace}(y1(t), t, s) - \text{laplace}(y2(t), t, s) + \frac{2}{s-1} \quad (6)$$

> eq2 := laplace(de2, t, s);

$$eq2 := s \text{laplace}(y2(t), t, s) - y2(0) = \text{laplace}(y1(t), t, s) - 2 \text{laplace}(y2(t), t, s) + \frac{2}{s^2+4} \quad (7)$$

> soln := solve({eq1, eq2}, {laplace(y1(t), t, s), laplace(y2(t), t, s)});

$$\text{soln} := \left\{ \text{laplace}(y1(t), t, s) = -\frac{1}{(s^4 + 6 s^3 + 13 s^2 + 24 s + 36) (s-1)} (-y1(0) s^4 \right. \quad (8)$$

$$+ y2(0) s^3 - y1(0) s^3 - y2(0) s^2 - 2 y1(0) s^2 - 2 s^3 + 4 y2(0) s - 4 y1(0) s - 4 s^2$$

$$- 4 y2(0) + 8 y1(0) - 6 s - 18), \text{laplace}(y2(t), t, s)$$

$$= \frac{1}{(s^4 + 6 s^3 + 13 s^2 + 24 s + 36) (s-1)} (y2(0) s^4 + 3 y2(0) s^3 + y1(0) s^3 - y1(0) s^2$$

$$+ 12 y2(0) s + 4 y1(0) s + 4 s^2 - 16 y2(0) - 4 y1(0) + 6 s) \left. \right\}$$

> Y1 := rhs(soln[1]); Y2 := rhs(soln[2]);

$$Y1 := -\frac{1}{(s^4 + 6 s^3 + 13 s^2 + 24 s + 36) (s-1)} (-y1(0) s^4 + y2(0) s^3 - y1(0) s^3 - y2(0) s^2$$

$$- 2 y1(0) s^2 - 2 s^3 + 4 y2(0) s - 4 y1(0) s - 4 s^2 - 4 y2(0) + 8 y1(0) - 6 s - 18)$$

$$Y2 := \frac{1}{(s^4 + 6 s^3 + 13 s^2 + 24 s + 36) (s-1)} (y2(0) s^4 + 3 y2(0) s^3 + y1(0) s^3 - y1(0) s^2 \quad (9)$$

$$+ 12 y_2(0) s + 4 y_1(0) s + 4 s^2 - 16 y_2(0) - 4 y_1(0) + 6 s)$$

> *invlaplace*(Y1, s, t);

$$\frac{3 e^t}{8} + \frac{12 \cos(2 t)}{169} - \frac{5 \sin(2 t)}{169}$$

$$+ \frac{(-1352 t y_2(0) - 1352 t y_1(0) + 1352 y_1(0) + 468 t - 603) e^{-3 t}}{1352}$$

(10)

> *invlaplace*(Y2, s, t);

$$\frac{e^t}{8} - \frac{38 \cos(2 t)}{169} + \frac{44 \sin(2 t)}{169}$$

$$+ \frac{e^{-3 t} (1352 t y_2(0) + 1352 t y_1(0) + 1352 y_2(0) - 468 t + 135)}{1352}$$

(11)

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