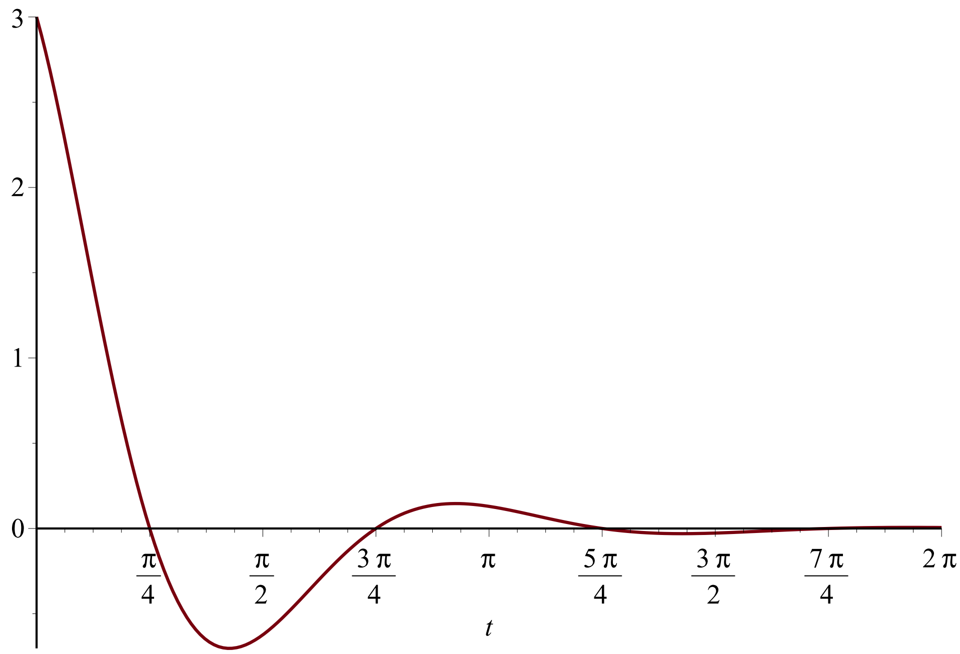
> $y := t \rightarrow 3 \cdot \exp(-t) \cdot \cos(2 \cdot t);$ *# This enters a function.*

$$y := t \rightarrow 3\, e^{-t} \cos(2\, t) \quad (1)$$

The arrow is created by typing - and >. The multiplication is *. Exponentiation uses ^.
The := in Maple means "defined to be."

> $plot(y(t), t = 0..2 \cdot \mathrm{Pi});$ *# This plots the function*



> $dy := diff(y(t), t);$ *# This differentiates the function*

$$dy := -3\, e^{-t} \cos(2\, t) - 6\, e^{-t} \sin(2\, t) \quad (2)$$

Maple stores the derivative of y(t) as dy.

> $tmin := fsolve(dy = 0, t = 1..2); y(tmin);$ *# This finds the minimum*

$$tmin := 1.338972522$$

$$-0.7033279401 \quad (3)$$

The absolute minimum occurs at (1.33897, -0.703328).
fsolve solves an equation, and here the solution search is restricted between 1 and 2.

> $tmax := fsolve(dy = 0, t = 2.5..3.5); y(tmax);$ *# This finds a local maximum*

$$tmax := 2.909768849$$

$$0.1462075142 \quad (4)$$

> $int(y(t), t);$ *# This finds the indefinite integral*

$$-\frac{3}{5}\, e^{-t} \cos(2\, t) + \frac{6}{5}\, e^{-t} \sin(2\, t) \quad (5)$$

> $int(y(t), t = 0..5); evalf(\%);$ *# This finds the definite integral from 0 to 5*

$$\frac{3}{5} - \frac{3}{5} e^{-5} \cos(10) + \frac{6}{5} e^{-5} \sin(10)$$

$$0.5989934692 \qquad (6)$$

The evalf function gives decimal values, while % means evaluate the previous expression

> $sdy := diff(y(t), t\$2);$ *# This takes the second derivative of y(t)*

$$sdy := -9\, e^{-t} \cos(2\, t) + 12\, e^{-t} \sin(2\, t) \qquad (7)$$

We want to see if y(t) satisfies the differential equation y'' + 2y' + 5y = 0.

> $sdy + 2 \cdot dy + 5 \cdot y(t);$

$$0 \qquad (8)$$

> $de := diff(Y(t), t\$2) + 2 \cdot diff(Y(t), t) + 5 \cdot Y(t) = 0;$

$$de := \frac{d^2}{dt^2} Y(t) + 2 \left(\frac{d}{dt} Y(t) \right) + 5\, Y(t) = 0 \qquad (9)$$

> $dsolve(de, Y(t));$ *# This solves the differential equation*

$$Y(t) = \_C1\, e^{-t} \sin(2\, t) + \_C2\, e^{-t} \cos(2\, t) \qquad (10)$$

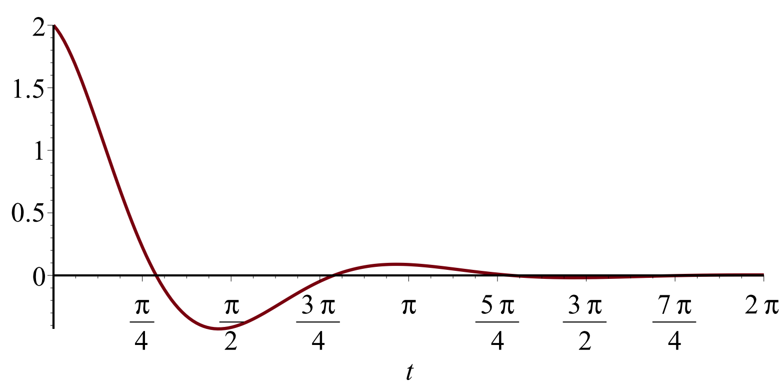
> $dsolve(\{de, Y(0) = 2, D(Y)(0) = -1\}, Y(t));$ *# This solves the initial value problem*

$$Y(t) = \frac{1}{2} e^{-t} \sin(2\, t) + 2\, e^{-t} \cos(2\, t) \qquad (11)$$

> $Y := unapply(rhs(\%), t);$ *# This transforms the solution into the function Y(t)*

$$Y := t \rightarrow \frac{1}{2} e^{-t} \sin(2\, t) + 2\, e^{-t} \cos(2\, t) \qquad (12)$$

> $plot(Y(t), t = 0..2 \cdot \mathrm{Pi});$



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