```
> # Define the homogeneous equation
  LL := m*diff(u(t), t$2) + gamma*diff(u(t), t) + k*u(t);

  # Solve the homogeneous equation
  hom_sol := dsolve(LL = 0, u(t)) assuming gamma^2 < 4*k*m;
```

$$LL := m \left(\frac{d^2}{dt^2} u(t) \right) + \gamma \left(\frac{d}{dt} u(t) \right) + k\, u(t)$$

$$hom\_sol := u(t) = c_1 e^{-\frac{\gamma t}{2 m}} \sin\left(\frac{\sqrt{-\gamma^2 + 4 k m}\; t}{2 m} \right) + c_2 e^{-\frac{\gamma t}{2 m}} \cos\left(\frac{\sqrt{-\gamma^2 + 4 k m}\; t}{2 m} \right) \quad (1)$$

```
> part_sol_coeff := solve({-m*alpha*omega^2 + beta*omega*gamma + k
      *alpha = A,
      -m*beta*omega^2 - alpha*omega*gamma + k*beta = 0},
      {alpha, beta});
```

$$part\_sol\_coeff := \left\{ \alpha = \frac{(-m \omega^2 + k) A}{m^2 \omega^4 + \gamma^2 \omega^2 - 2 k m \omega^2 + k^2}, \beta = \frac{\gamma \omega A}{m^2 \omega^4 + \gamma^2 \omega^2 - 2 k m \omega^2 + k^2} \right\} \quad (2)$$

```
> # Dus de particuliere oplossing is dan:
> particuliere_oplossing := rhs(part_sol_coeff[1]·sin(omega·t)
      + part_sol_coeff[2]·cos(omega·t))
```

$$particuliere\_oplossing := \frac{\sin(\omega t)\, (-m \omega^2 + k) A}{m^2 \omega^4 + \gamma^2 \omega^2 - 2 k m \omega^2 + k^2} + \frac{\cos(\omega t)\, \gamma \omega A}{m^2 \omega^4 + \gamma^2 \omega^2 - 2 k m \omega^2 + k^2} \quad (3)$$

```
> # De algemene oplossing is dan
> # Solve the full equation
  full_sol := dsolve(LL = A*sin(omega*t), u(t)) assuming gamma^2 < 4*k*m;
```

$$full\_sol := u(t) = e^{-\frac{\gamma t}{2 m}} \sin\left(\frac{\sqrt{-\gamma^2 + 4 k m}\; t}{2 m} \right) c_2 + e^{-\frac{\gamma t}{2 m}} \cos\left(\frac{\sqrt{-\gamma^2 + 4 k m}\; t}{2 m} \right) c_1 + \frac{A \left((-m \omega^2 + k) \sin(\omega t) - \cos(\omega t) \gamma \omega \right)}{m^2 \omega^4 + (\gamma^2 - 2 k m) \omega^2 + k^2} \quad (4)$$