$t y' - 2y = t^4 \sin\left(\frac{t}{2}\right) \quad y' - \frac{2y}{t} = t^3 \sin\left(\frac{t}{2}\right)$

$y' + P(t)y = Q(t) \quad P(t) = -\frac{2}{t} \quad Q(t) = t^3 \sin\frac{t}{2}$

$y = uv, \; y' = u'v + uv', \; v$ - laisvai reiškiamas

$u'v + uv' - \frac{2uv}{t} = \sin\left(\frac{t}{2}\right) t^3$

$u'v + u\left(v' - \frac{2v}{t}\right) = \sin\left(\frac{t}{2}\right) t^3$

Laisvai reiškiamas, reiškiamės $= 0$

$v' - \frac{2v}{t} = 0 \quad \frac{dv}{dt} = \frac{2v}{t} \quad \frac{dv}{v} = \frac{2\,dt}{t}$

$\int \frac{dv}{v} = \int \frac{2\,dt}{t} \quad \int \frac{1}{v}\,dv = \int \frac{2}{t}\,dt = 2\int \frac{1}{t}\,dt$

$\ln(v) = 2\ln(t) \quad e^{\ln v} = e^{2\ln t} = e^{\ln t^2} \Rightarrow$

$\Rightarrow v = t^2 \quad u'v = \sin\left(\frac{t}{2}\right) t^3 \Rightarrow u' t^2 = \sin\left(\frac{t}{2}\right) t^3$

$u' = t \cdot \sin\frac{t}{2} \quad \frac{du}{dt} = t \cdot \sin\left(\frac{t}{2}\right) \quad du = \sin\left(\frac{t}{2}\right) \cdot t\,dt$

$\int du = \int \sin\left(\frac{t}{2}\right) \cdot t\,dt \quad \int du = u$ $\boxed{\frac{t}{2} = x, \; t = 2x, \; dt = 2dx}$

$\int \sin\left(\frac{t}{2}\right) \cdot t\,dt = \int \sin x \cdot 2x \cdot 2dx = \int 4x \sin x\,dx =$

$= 4\left(x \cdot (-\cos(x)) + \int x' \cos(x)\,dx\right) = 4\left(-x\cos x + \int \cos x\,dx\right) =$

$= 4(-x\cos x + \sin(x)) = \boxed{-4x\cos x + 4\sin x}$

$x = \frac{t}{2}$

$$\int fg' = fg - \int f'g$$

$u = -4\left(\frac{t}{2}\right)\cos\left(\frac{t}{2}\right) + 4\sin\left(\frac{t}{2}\right) + C$

$y = uv \Rightarrow u = \frac{y}{v}$ $\quad \frac{y}{v} = -4\cos\left(\frac{t}{2}\right)\frac{t}{2} + 4\sin\left(\frac{t}{2}\right) + C$ $\quad v = t^2$

$y = t^2 \cdot \left(4\sin\frac{t}{2} - 2t\cos\frac{t}{2}\right)$

$y = 4t^2 \cdot \sin\left(\frac{t}{2}\right) - 2t^3 \cdot \cos\left(\frac{t}{2}\right) + C \cdot t^2$

$t_0 = \pi \quad y_0 = 2\pi^2$

$\sin\frac{\pi}{2} = 1$

$\cos\frac{\pi}{2} = 0$

$2\pi^2 = 4\pi^2 \cdot \sin\left(\frac{\pi}{2}\right) - 2\pi^3 \cdot \cos\left(\frac{\pi}{2}\right) + C \cdot \pi^2$

~~$2\pi^2 = 4\pi \cdot 0 - 2\pi^3 \cdot (-0{,}5) + C \cdot \pi^2$~~

~~$2\pi^2 = \pi^2 + C\pi^2$~~

$2\pi^2 = 4\pi^2 \cdot 1 - 2\pi^3 \cdot 0 + C \cdot \pi^2$

$2\pi^2 = 4\pi^2 + C\pi^2 \quad C\pi^2 = -2\pi^2 \quad \boxed{C = -2}$

Galutinė formulė:

$y = 4t^2 \cdot \sin\left(\frac{t}{2}\right) - 2t^3\cos\left(\frac{t}{2}\right) - 2t^2$