Ordinary Differential Equations
Classification

Question
Find a solution of $y'' + y = 0$ given that $y(\pi/2) = 2y(0)$ and $y(\pi/4) = 3$.
Answer
$y = A\cos x + B\sin x$, for any A or B, gives a solution to $y'' + y = 0$.
To satisfy the given conditions:

$$\begin{aligned} 0 &= y(\pi/2) - 2y(0) + B - 2A \\ 3 &= y(\pi/r) = \frac{A}{\sqrt{2}} + \frac{B}{\sqrt{2}} \end{aligned}$$

provided that

$$\begin{aligned} A &= \sqrt{2} \\ B &= 2\sqrt{2} \end{aligned}$$

So the solution is

$$y = \sqrt{2}\cos x + 2\sqrt{2}\sin x$$