Form: $y' + P(x)y = Q(x)$

3. $y' + \frac{1}{x}y = 2\cos(4x)$

$P(x)$

② I.F.

$\mu(x) = e^{\int P(x)\,dx}$

$= e^{\int \frac{1}{x}\,dx}$

$= e^{\ln x}$

$= x$

③ $x\left(y' + \frac{1}{x}y\right) = x\left(2\cos(4x)\right)$

$xy' + 1y = 2x\cos(4x)$

Q P' Q' P

④ $\frac{d}{dx}[yx] = 2x\cos(4x)$

⑤ $\int \frac{d}{dx}[yx]\,dx = \int \left(2x\cos(4x)\right)dx$ "PARTS"

| S | D | I |
|---|---|---|
| + | $2x$ | $\cos(4x)$ |
| − | $2$ | $\frac{1}{4}\sin(4x)$ |
| + | $0$ | $-\frac{1}{16}\cos(4x)$ |

$yx = \frac{1}{2}x\sin(4x) + \frac{1}{8}\cos(4x) + C$

$\frac{yx}{x} = \frac{x\sin(4x)}{2x} + \frac{\cos(4x)}{8x} + \frac{C}{x}$

$y = \frac{\sin(4x)}{2} + \frac{\cos(4x)}{8x} + \frac{C}{x}$