## Exercise 1

$eq := diff(u(x), x\$2) + 5 \cdot diff(u(x), x) - 7 \cdot u(x) = 5 \cdot \cos(x) - 7 \cdot \sin(x);$

$$\frac{d^2}{dx^2} u(x) + 5 \left( \frac{d}{dx} u(x) \right) - 7\, u(x) = 5 \cos(x) - 7 \sin(x) \tag{1}$$

$sol := dsolve(eq, u(x));$

$$u(x) = e^{\frac{1}{2}(-5+\sqrt{53})x} \_C2 + e^{-\frac{1}{2}(5+\sqrt{53})x} \_C1 - \frac{5}{89} \cos(x) + \frac{81}{89} \sin(x) \tag{2}$$

$solexpr := rhs(sol);$

$$e^{\frac{1}{2}(-5+\sqrt{53})x} \_C2 + e^{-\frac{1}{2}(5+\sqrt{53})x} \_C1 - \frac{5}{89} \cos(x) + \frac{81}{89} \sin(x) \tag{3}$$

$simplify\left( solexpr\left( \frac{Pi}{2} \right) \right);$

$$e^{\frac{1}{2}(-5+\sqrt{53})x} \left( \frac{1}{2}\pi \right) \_C2 \left( \frac{1}{2}\pi \right) + e^{-\frac{1}{2}(5+\sqrt{53})x} \left( \frac{1}{2}\pi \right) \_C1 \left( \frac{1}{2}\pi \right) - \frac{5}{89} \cos(x) \left( \frac{1}{2}\pi \right) + \frac{81}{89} \sin(x) \left( \frac{1}{2}\pi \right) \tag{4}$$

$eval\left( D(solexpr) \left( \frac{Pi}{2} \right) \right);$

$$D\left( e^{\frac{1}{2}(-5+\sqrt{53})x} \right) \left( \frac{1}{2}\pi \right) \_C2 \left( \frac{1}{2}\pi \right) + e^{\frac{1}{2}(-5+\sqrt{53})x} \left( \frac{1}{2}\pi \right) D(\_C2) \left( \frac{1}{2}\pi \right) + D\left( e^{-\frac{1}{2}(5+\sqrt{53})x} \right) \left( \frac{1}{2}\pi \right) \_C1 \left( \frac{1}{2}\pi \right) + e^{-\frac{1}{2}(5+\sqrt{53})x} \left( \frac{1}{2}\pi \right) D(\_C1) \left( \frac{1}{2}\pi \right) - \frac{5}{89} D(\cos(x)) \left( \frac{1}{2}\pi \right) + \frac{81}{89} D(\sin(x)) \left( \frac{1}{2}\pi \right) \tag{5}$$