Problem:

$$\int \frac{x^2}{(x\sin(x)+\cos(x))^2}\,\mathrm{d}x$$

Rewrite:

$$= \int \left(\frac{x\sin(x)}{x\sin(x)+\cos(x)} - \frac{x\cos(x)\,(\sin(x)-x\cos(x))}{(x\sin(x)+\cos(x))^2} \right) \mathrm{d}x$$

Apply linearity:

$$= \int \frac{x\sin(x)}{x\sin(x)+\cos(x)}\,\mathrm{d}x - \int \frac{x\cos(x)\,(\sin(x)-x\cos(x))}{(x\sin(x)+\cos(x))^2}\,\mathrm{d}x$$

Within the sum, apply integration by parts for $\int \frac{x\cos(x)\,(\sin(x)-x\cos(x))}{(x\sin(x)+\cos(x))^2}\,\mathrm{d}x$: $\int \mathtt{f}\mathtt{g}' = \mathtt{f}\mathtt{g} - \int \mathtt{f}'\mathtt{g}$,

$$\mathtt{f} = \sin(x) - x\cos(x),\ \mathtt{g}' = \frac{x\cos(x)}{(x\sin(x)+\cos(x))^2}$$

$\downarrow$ steps $\qquad\qquad$ $\downarrow$ steps

$$\mathtt{f}' = x\sin(x), \qquad \mathtt{g} = -\frac{1}{x\sin(x)+\cos(x)}:$$

$$= \frac{\sin(x) - x\cos(x)}{x\sin(x)+\cos(x)} + \int -\frac{x\sin(x)}{x\sin(x)+\cos(x)}\,\mathrm{d}x + \int \frac{x\sin(x)}{x\sin(x)+\cos(x)}\,\mathrm{d}x$$

The integral $\int \frac{x\sin(x)}{x\sin(x)+\cos(x)}\,\mathrm{d}x$ cancels, leaving only:

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

ANTIDERIVATIVE COMPUTED BY MAXIMA:

$$\int f(x)\,dx = F(x) =$$

$$-\frac{(2x^2-2)\sin(2x)+4x\cos(2x)}{(x^2+1)\sin^2(2x)+4x\sin(2x)+(x^2+1)\cos^2(2x)+(2-2x^2)\cos(2x)+x^2+1}+C$$

Simplify