Step 1: Find the derivative i'(x)

Given: $i(x) = x^2 \cdot \sqrt{(x^2 + 1)}$

Using the product rule: $i'(x) = 2x \cdot \sqrt{(x^2 + 1)} + x^2 \cdot (1/2)(x^2 + 1)^{(-1/2)} \cdot 2x$

$i'(x) = 2x\sqrt{(x^2 + 1)} + x^3/\sqrt{(x^2 + 1)}$

$i'(x) = (2x(x^2 + 1) + x^3)/\sqrt{(x^2 + 1)}$

$i'(x) = (2x^3 + 2x + x^3)/\sqrt{(x^2 + 1)}$

$i'(x) = (3x^3 + 2x)/\sqrt{(x^2 + 1)}$

Step 2: Integrate i'(x) using substitution

$\int (3x^3 + 2x)/\sqrt{(x^2 + 1)}\, dx$

Let $u = x^2 + 1$, then $du = 2x\, dx$, so $x\, dx = du/2$

Also, $x^2 = u - 1$

Substituting: $\int (3(u-1) + 2)/(2\sqrt{u})\, du = \int (3u - 1)/(2\sqrt{u})\, du$

$= (1/2)\int (3u^{(1/2)} - u^{(-1/2)})\, du$

$= (1/2)[3 \cdot (2/3)u^{(3/2)} - 2u^{(1/2)}] + C$

$= (1/2)[2u^{(3/2)} - 2u^{(1/2)}] + C$

$= u^{(3/2)} - u^{(1/2)} + C$

$= (x^2 + 1)^{(3/2)} - (x^2 + 1)^{(1/2)} + C$

Step 3: Simplify to match original form

$= \sqrt{(x^2 + 1)}[(x^2 + 1) - 1] + C$

$= \sqrt{(x^2 + 1)} \cdot x^2 + C$

$= x^2\sqrt{(x^2 + 1)} + C$

Step 4: Verification

This matches $i(x) = x^2\sqrt{(x^2 + 1)}$ when $C = 0$, confirming our integration is correct.