$$\boxed{\frac{d}{dx}\int_a^x f(t)\,dt = f(x)}$$

$$\frac{d}{dx}\int_0^x \sqrt{t^2+4}\,dt \qquad f(t)=\sqrt{t^2+4}$$

$$\frac{d}{dx}\int_0^x f(t)\,dx = \frac{d}{dt}\left(F(t)\Big|_0^x\right) = \frac{d}{dx}\left(F_{(x)}-F_{(0)}\right) = f(x)-0 = f(x)$$

$$f(x)=\underline{\underline{\sqrt{x^2+4}}}$$

$$\frac{d}{dx}\int_0^x \sqrt{t^2+4}\,dt = \underline{\underline{\sqrt{x^2+4}}}$$

$$\frac{d}{dx}\left(\int_x^4 \sqrt{t^3+5}\,dt\right) = -\sqrt{x^3+5} \qquad f(t)=\sqrt{t^3+5}$$

$$\frac{d}{dx}\left(-\int_4^x f(t)\,dt\right) = \frac{d}{dx}\left(-F(t)\Big|_4^x\right) = \frac{d}{dx}\left(-F_{(x)}+F_{(4)}\right) = -f(x)+0 = -f(x)$$

$$-f(x) = -\underline{\underline{\sqrt{x^3+5}}}$$

$$\frac{d}{dx}\left(\int_5^{x^2}\sqrt{t^3-4}\,dt\right) = \underline{\underline{2x\cdot\sqrt{x^6-4}}} \qquad f(t)=\sqrt{t^3-4}$$

$$\frac{d}{dx}\left(\int_5^{x^2} f(t)\,dt\right) = \frac{d}{dx}\left(F_{(t)}\Big|_5^{x^2}\right) = \frac{d}{dx}\left(F_{(x^2)}-F_{(5)}\right) = f(x^2)\cdot 2x - 0 = f(x^2)\cdot 2x$$

$$2x\cdot f(x^2) = \sqrt{(x^2)^3-4}\cdot 2x$$

$$\frac{d}{dx}\left(\int_{x^2}^{x^3}\sqrt{t^4-2}\,dt\right) \qquad f(t)=\sqrt{t^4-2}$$

$$\frac{d}{dx}\left(\int_{x^2} f(t)\,dt\right) = \frac{d}{dx}\left(F(t)\Big|_{x^2}\right) = \frac{d}{dx}\left(F(x^3) - F(x^2)\right) = 3x^2 f(x^3) - 2x f(x^2) =$$

$$= 3x^2\sqrt{x^{12}-2} - 2x\sqrt{x^8-2}$$