Ex 2) $\frac{d}{dx}\int_0^x \left(\frac{1}{1+t^2}\right) dt = \frac{1}{1+x^2}$

Ex 3) $\frac{d}{dx}\int_0^{x^2} (\cos t)\, dt = \cos x^2 \cdot \frac{d}{dx} x^2$ (chain rule)

not match!

$= \cos x^2 \cdot 2x$

$= 2x \cos x^2$

Ex 4) $\frac{d}{dx}\int_x^5 (3t \cdot \sin t)\, dt$

not a constant so flip

$-\frac{d}{dx}\int_5^x (3t \cdot \sin t)\, dt = -3x \sin x$

Ex 5) $\frac{d}{dx}\int_{2x}^{x^2} \frac{1}{2+e^t}\, dt$

neither are constants so split

$\frac{d}{dx}\left(\int_0^{x^2} \frac{1}{2+e^t}\, dt + \int_{2x}^0 \frac{1}{2+e^t}\, dt\right)$

$= \frac{d}{dx}\left(\int_0^{x^2} \frac{1}{2+e^t} - \int_0^{2x} \frac{1}{2+e^t}\, dt\right) = \frac{1}{2+e^{x^2}} \cdot 2x - \frac{1}{2+e^{2x}} \cdot 2$

$= \frac{2x}{2+e^{x^2}} - \frac{2}{2+e^{2x}}$