$\Leftrightarrow x\left(\frac{1}{2}x^2-1\right)=0 \quad \Leftrightarrow x=0$ tai $\frac{1}{2}x^2-1=0 \quad |\cdot 2$

$\Leftrightarrow x^2=2 \quad |\sqrt{\ }$

$\Leftrightarrow x=\pm\sqrt{2}$

Vast. $x=\sqrt{2}$

7. Yhdistetyn funktion integrointi

$D(\varphi(x))^n = n(\varphi(x))^{n-1}\cdot\varphi'(x) \Rightarrow \boxed{\int \varphi'(x)(\varphi(x))^n\,dx = \frac{1}{n+1}(\varphi(x))^{n+1}+C}$

sisäfunktion derivaatta

$n\neq -1$

Esim. a) $\int x\underbrace{(3x^2+5)}_{\varphi(x)}^8\,dx = \int \frac{1}{6}\cdot\underbrace{6x}_{\varphi'(x)}\underbrace{(3x^2+5)}_{\varphi(x)}^8\,dx = \frac{1}{6}\int \underbrace{6x}_{\varphi'(x)}\underbrace{(3x^2+5)}_{\varphi(x)}^8\,dx$

$= \frac{1}{6}\cdot\frac{1}{9}(3x^2+5)^9+C = \frac{1}{54}(3x^2+5)^9+C$

b) $\int \underbrace{(3x^2+5)}_{\varphi(x)}^8\,dx$

↑ ei saada $\varphi'(x)=6x$:ää koska x:iä ei saa lisäillä!

→ ei auttaa a-kohdan menetelmällä vaan jotain muuta kuin kertoo sulut auki → työlästä

c) $\int \frac{2}{\sqrt{3x+1}}\,dx = \int \frac{2}{(3x+1)^{\frac{1}{2}}}\,dx = \int 2(3x+1)^{-\frac{1}{2}}\,dx$

$= 2\cdot\frac{1}{3}\int \underbrace{3}_{\varphi'(x)}\underbrace{(3x+1)}_{\varphi(x)}^{-\frac{1}{2}}\,dx = \frac{2}{3}\cdot\frac{1}{\frac{1}{2}}(3x+1)^{\frac{1}{2}}+C$

$= \frac{4}{3}\sqrt{3x+1}+C$

7.4 a) $\int \frac{x}{(x^2+1)^2}\,dx = \int x\underbrace{(x^2+1)}_{\varphi(x)}^{-2}\,dx = \frac{1}{2}\int \underbrace{2x}_{\varphi'(x)}\underbrace{(x^2+1)}_{\varphi(x)}^{-2}\,dx$

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

b) $\int \frac{1}{\sqrt{2x+1}}\,dx = \int (2x+1)^{-\frac{1}{2}}\,dx = \frac{1}{2}\int \underbrace{2}_{\varphi'(x)}\underbrace{(2x+1)}_{\varphi(x)}^{-\frac{1}{2}}\,dx$

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

7.8 a) $\int (x-1)\sqrt{x-1}\,dx = \int (x-1)^1\cdot(x-1)^{\frac{1}{2}}\,dx = \int \underbrace{1}_{\varphi'(x)}\cdot\underbrace{(x-1)}_{\varphi(x)}^{\frac{3}{2}}\,dx$