

Luento 4 esim. 2

18.9.01

```
> dyht:=diff(y(x),x)-2*x*y(x)=1;AE:=y(0)=y0;
```

$$dyht := \frac{d}{dx} y(x) - 2xy(x) = 1$$

$$AE := y(0) = y_0$$

(1)

```
> ratk:=dsolve({dyht,AE},y(x));
```

$$ratk := y(x) = \left(\frac{1}{2} \sqrt{\pi} \operatorname{erf}(x) + y_0 \right) e^{x^2}$$

(2)

```
> int(exp(-t^2),t);
```

$$\frac{1}{2} \sqrt{\pi} \operatorname{erf}(t)$$

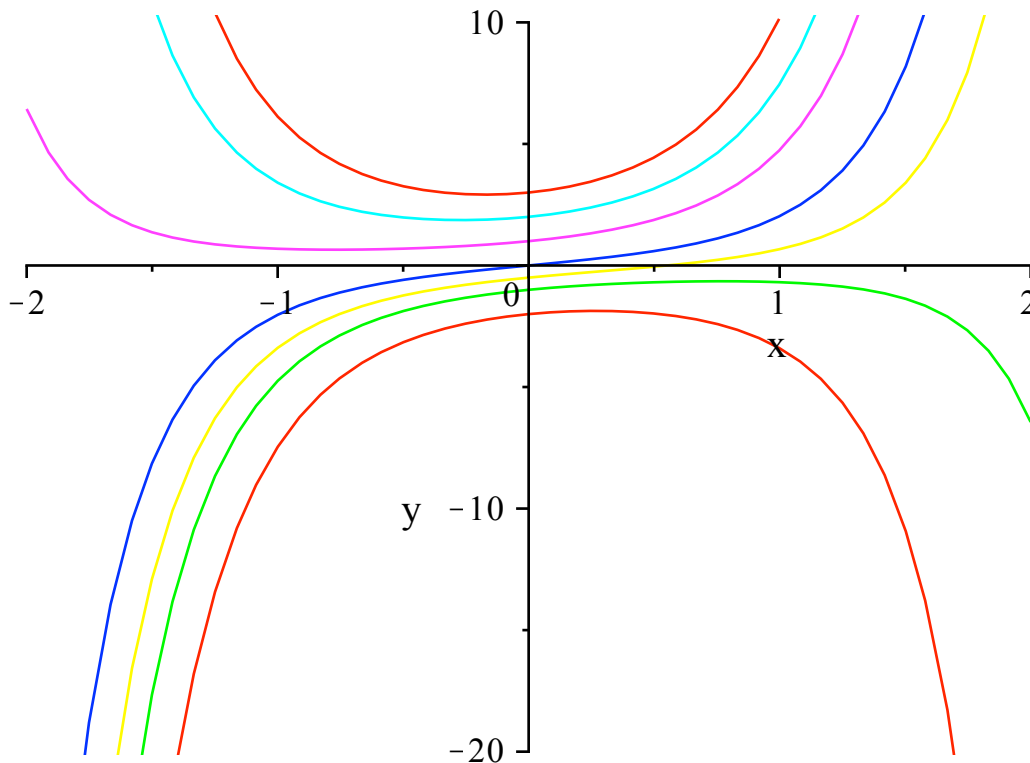
(3)

```
> Y:=subs(ratk,y(x));
```

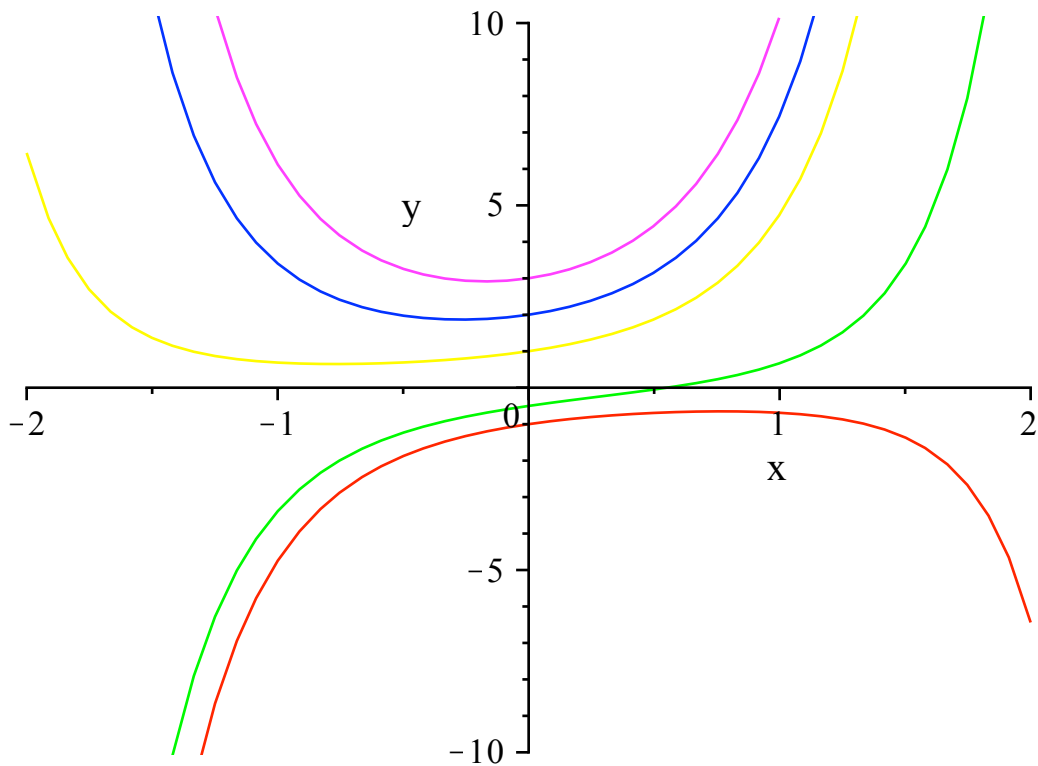
$$Y := \left(\frac{1}{2} \sqrt{\pi} \operatorname{erf}(x) + y_0 \right) e^{x^2}$$

(4)

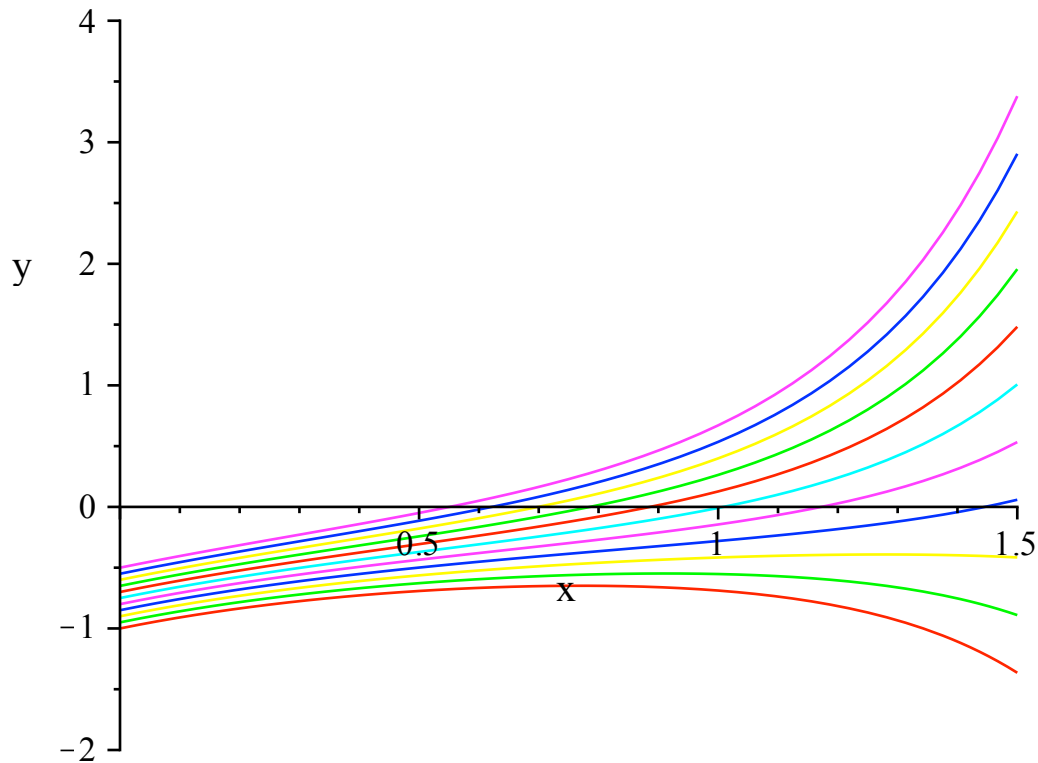
```
> plot([seq(Y,y0=[-2,-1,-0.5,0,1,2,3])],x=-2..2,y=-20..10);
```



```
> plot([seq(Y,y0=[-1,-0.5,1,2,3])],x=-2..2,y=-10..10);
```



```
> plot([seq(Y,y0=[seq(-1+k*0.05,k=0..10)]),x=0..1.5,y=-2..4);
```



Jossain -1:n ja -0.5:n väällä on kriittinen AA, joka jakaa ratkaisuperheen niihin, jotka $\rightarrow \infty$ ja niihin, jotka $\rightarrow -\infty$

Harjoitustehtävä: Laske tuo kriittinen AA.

```
> Y;
```

$$\left(\frac{1}{2}\sqrt{\pi}\operatorname{erf}(x)+y_0\right)e^{x^2} \quad (5)$$

```
> solve(1/2*sqrt(Pi)*erf(x)+y0=0,y0);
```

$$-\frac{1}{2}\sqrt{\pi}\operatorname{erf}(x) \quad (6)$$

```
> limit(1/2*sqrt(Pi)*erf(x)+y0,x=infinity);
```

$$\frac{1}{2}\sqrt{\pi}+y_0 \quad (7)$$

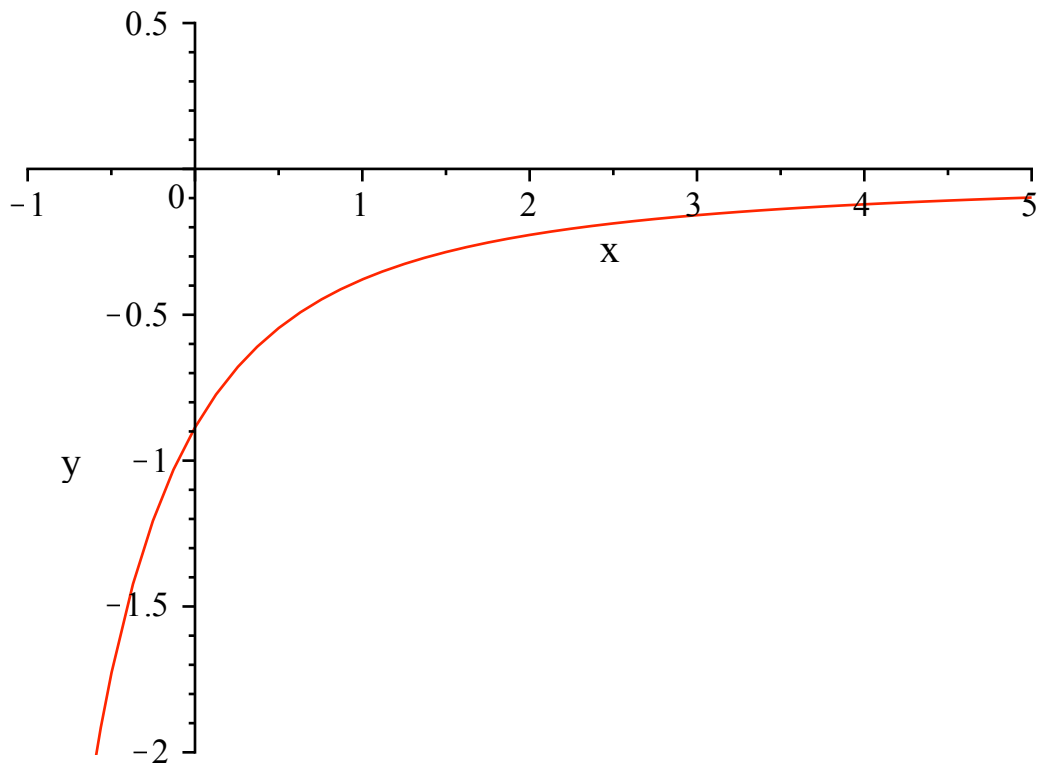
```
> ykr0:=solve(%=0,y0);
```

$$ykr0 := -\frac{1}{2}\sqrt{\pi} \quad (8)$$

```
> evalf(%);
```

$$-0.8862269255 \quad (9)$$

```
> plot(subs(y0=ykr0,Y),x=-1..5,y=-2..0.5);
```



[Tämä on ainoa, joka on rajoitettu.