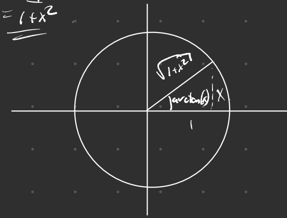
1) $f(f^{-1}(x)) = x$

$f(f^{-1}(x))' = x'$

$f'(f^{-1}(x)) \cdot f^{-1}{}'(x) = 1$

$f^{-1}{}'(x) = \frac{1}{f'(f^{-1}(x))}$

$(\arctan)' = \frac{1}{\tan'(\arctan(x))} = \cos^2(\arctan(x)) = \left(\frac{1}{\sqrt{1+x^2}}\right)^2 = \underline{\underline{\frac{1}{1+x^2}}}$



$(\tan(x))' = \left(\frac{\sin(x)}{\cos(x)}\right)' = \frac{(\sin x)'(\cos x) - (\sin x)(\cos x)'}{(\cos x)^2} = \frac{1}{\cos^2 x}$

$(\arctan)' = \frac{1}{\tan'(\arctan(x))} = \frac{1}{1+\tan^2(\arctan(x))}$

$(\arctan)' = \underline{\underline{\frac{1}{1+x^2}}}$

2) Vi ser at $v_1, v_2 \ldots v_n$ er lineært uavhengig hvis

$c_1 v_1 + c_2 v_2 + c_n v_n = 0$

Antar to vektor summer

$w = c_1 v_1 + c_2 v_2 + c_n v_n$

$w = b_1 v_1 + b_2 v_2 + b_n v_n$

$w - w = 0 = (c_1 - b_1) v_1 + (c_2 - b_2) v_2 \ldots + (c_3 - b_3) v_3$

ser at

$c_1 - b_1 = c_2 - b_2 = c_n - b_n = 0$

3) $f : [0,1] \to \mathbb{R}$

$s = \int_a^b \sqrt{1 + f'(x)^2}$ $\quad f'(x) = \frac{1}{1+x^2}$

```
import numpy as np
def f(x):
    return np.sqrt(1 + (1/(1+x**2))**2)

a=0
b=1
n=10000
h=(b-a)/n
summen=0
for i in range(n):
    x0 = a+h*i
    x1 = a+h*(i+1)
    summen += (h/2)*(f(x0)+f(x1))
```

4) Ikke pensum

5)
```
import numpy as np
a=0
b=10
n=10000
h=(b-a)/n
y=np.zeros(n+1)
x=np.zeros(n+1)
y[0]=1
x[0]=1
for i in range(n):
    x[i+1]=x[i]+h*(x[i]-x[i]*y[i])
    y[i+1]=y[i]+h*(-y[i]+x[i]*y[i])
```

⑥ $g'(s) = \frac{f(b)-f(a)}{b-a}$ $\quad g(x_n) = x_{n+1}$

$r = g(r)$

$g'(s) = \frac{g(x_n) - g(r)}{x_n - r}$

$g(x_n) - g(r) = g'(s)(x_n - r)$

$x_{n+1} - r = g'(s)(x_n - r)$

⑦ $f(x) = \sqrt{r^2 - x^2}$ $\quad f(x)^2 = r^2 - x^2$

$V = \pi \cdot \int_{-r}^{r} r^2 - x^2\, dx = \pi \cdot \left[xr^2 - \frac{1}{3}x^3\right]_{-r}^{r} = \pi \cdot \left(r^3 - \frac{1}{3}r^3 + r^3 - \frac{1}{3}r^3\right) = \frac{4\pi r^3}{3}$

⑧ Analysens fundamentteorem

$f(x) = f(a) + \int_a^x f'(t)\, dt$

$f(a) - \int_a^x (-1) f'(t)\, dt$

$f(a) - \left(f'(a)(x-t)\Big|_a^x - \int_a^x (x-s) f''(t)\, dt\right)$

$= f(a) + f'(a)(x-a) + \int_a^x (x-s) f''(t)\, dt$

⑨ $\dot{x} = ax$

$x = e^{-at}$

$e^{-5730a} = \frac{1}{2}$

$a = -\frac{\ln 2}{5370}$

$e^{-\frac{\ln 2}{5370}t} = 0{,}27$

$t = -\frac{\ln 0{,}27 \cdot 5370}{\ln 2}$

⑩ $\begin{bmatrix} 2 & 1 & 1 & 2 \\ 1 & 0 & 1 & 1 \\ 1 & -2 & 1 & -1 \\ 0 & 1 & 0 & 1 \end{bmatrix} \sim$

$\begin{matrix} 2 & 1 & 1 & 2 \\ -2(1 & 0 & 1 & 1) \\ \hline 0 & 1 & -1 & 0 \end{matrix}$ $\quad \begin{matrix} -(0 & 1 & -1 & 0) \\ 0 & 1 & 0 & 1 \\ \hline 0 & 1 & 1 & \end{matrix}$

$\begin{matrix} 2 & 1 & 1 & 2 \\ -2(1 & -2 & 1 & -1) \\ \hline 0 & 5 & -1 & 4 \end{matrix}$ $\quad \begin{matrix} -5(0 & 1 & -1 & 0) \\ (0 & 5 & -1 & 4) \\ \hline 0 & 0 & 4 & 4 \end{matrix}$

$\rightarrow \begin{bmatrix} 2 & 1 & 1 & 2 \\ 1 & 0 & 1 & 1 \\ 1 & -2 & 1 & -1 \end{bmatrix}$ 3 dim vektorer