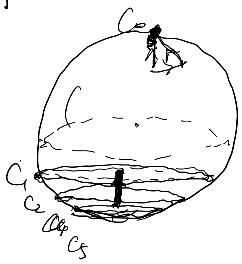
1.14

Friday, September 11, 2020 1:59 PM

Welcome to the TUT0115A
We will start at 8:10.
I am going to answer your questions, so please come with questions prepared.

An Old Question:

A man on the earth moves toward south 10km, then east 10km, then north 10km. Finally he moves back to the start position. Where is this start position on the earth?

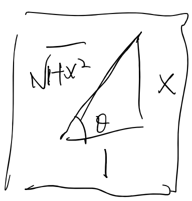


Q1:

$$I = \int_a \frac{1}{\sqrt{v^2 - k^2 s^2}}\, ds = \int \frac{1}{\sqrt{v^2 - t^2}}\, ds \ ?$$

by ① $\frac{ds}{dt} = \frac{d}{dt}\frac{t}{k} = \frac{1}{k} \Rightarrow ds = \frac{1}{k} dt$

$$I = \int_{ka}^{kb} \frac{1}{\sqrt{v^2 - t^2}}\, dt \cdot \frac{1}{k} \Rightarrow \frac{1}{k} \arctan\left(\frac{t}{\sqrt{v^2 - t^2}}\right)\Bigg|_{ka}^{kb}$$



$\cos\theta = \frac{1}{\sqrt{1+x^2}}$ $\tan = x.$

$\sin\theta = \frac{x}{\sqrt{1+x^2}}$

$$\int v\, dv = \int -k^2 s\, ds + C_1.$$

Q2:

$$\boxed{\int \sqrt{\tan x}\, dx} = \quad \cos x = t$$

$$= \int \sqrt{\frac{\sin x}{t}}\, dt \cdot -\sin x$$

$$= \int \sqrt{\frac{\sqrt{1-t^2}}{t}}\, dt \left(-\sqrt{1-t^2}\right).$$

Htanθ

$$\boxed{= -\int \frac{(1-t^2)^{3/2}}{\sqrt{t}}\, dt}$$

$$\boxed{\tan x} = x + \frac{x^3}{3} + \frac{2x^5}{15} + \frac{17x^7}{315} + O(x^9)$$ Series expansion

$\tan(x) = x + \frac{x^3}{3} + \frac{\cdots}{15} + \frac{\cdots}{315} + O(x^9)$ Series expansion

sin x, cos x

$\tan(x+\delta x) = (x+\delta x) + \frac{(x+\delta x)^3}{3} + \cdots$

$\tan x =$

Q3.

asec(x)

singularity

$\int x\,dx = \frac{x^2}{2} + C$

a tan 1 C

− a tan 1 C

$\{ \frac{x^2}{2} + C \,;\, C \in \mathbb{R} \}$

Q4.

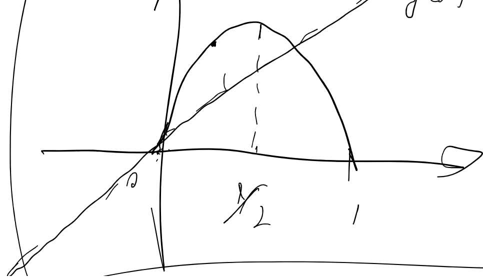
$n > 0$

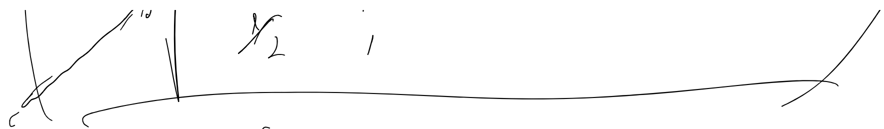
$k < 1$

$n + k = 1$

$k = 1 - n$

$f(x) = x(1-x)$ $g(x) = x$



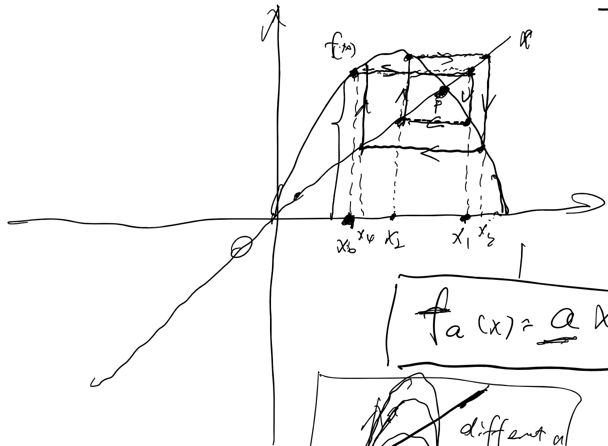


$$\boxed{x_{n+1} = x_n(1-x_n)} \quad ①$$

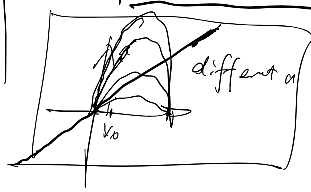
$f(x) = x(1-x)$ $\quad a=1$

$x_1 = f(x_0)$

$x_2 = f(x_1)$



$$\boxed{f_a(x) = \underline{a}\, x(1-x)}$$



chaos. $\quad a = 1.7\ldots \quad$ 3-period.