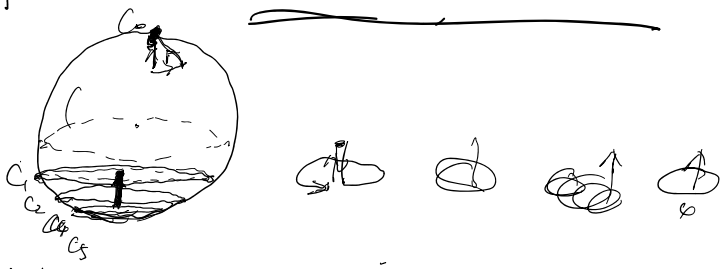
1.14

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:

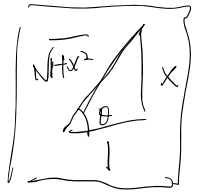
A man on the earth moves toward south 10km, then east 10km, then north 10km. Finally he moves back to the start position. Where is this start position on the earth?



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

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:

$$\int \sqrt{\tan x}\, dx$$

$\cos x = t$

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

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

Hang

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

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

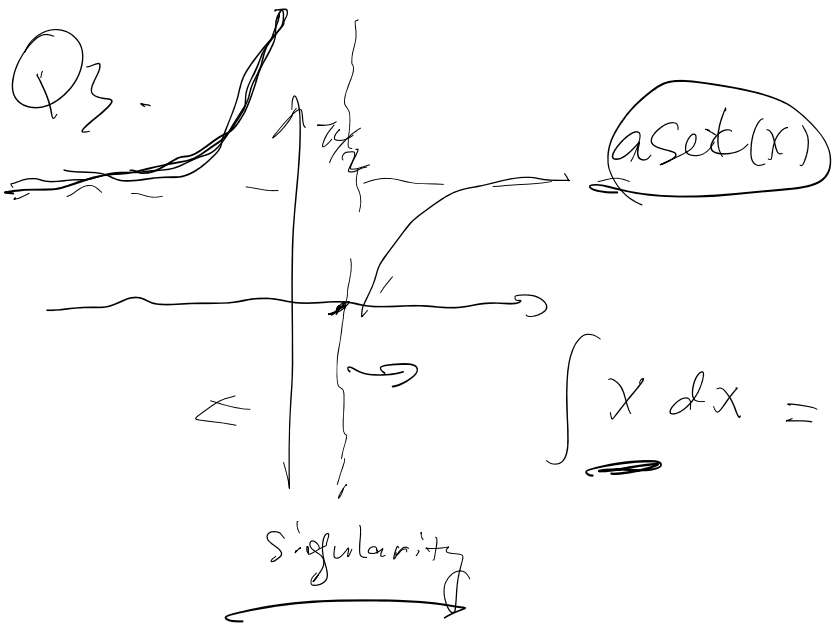
Series expansion

$\sin x \quad \cos x$

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

$\tan x =$

Q3.



$\int x\,dx = \left\{ \frac{x^2}{2} + C \right\}$ $\quad \begin{matrix} \arctan 1 C \\ -\arctan 1 C \end{matrix}$

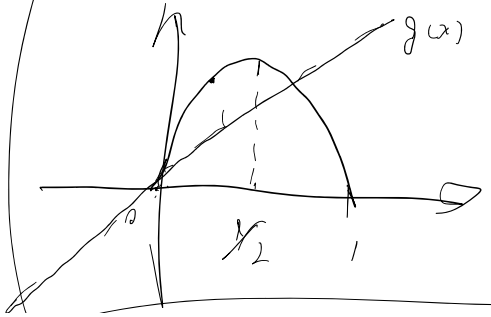
$\left\{ \frac{x^2}{2} + C \mid C \in \mathbb{R} \right\}$.

Q4. $n > 0$

$k < 1$ $\quad n+k=1$

$k = 1-n$

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

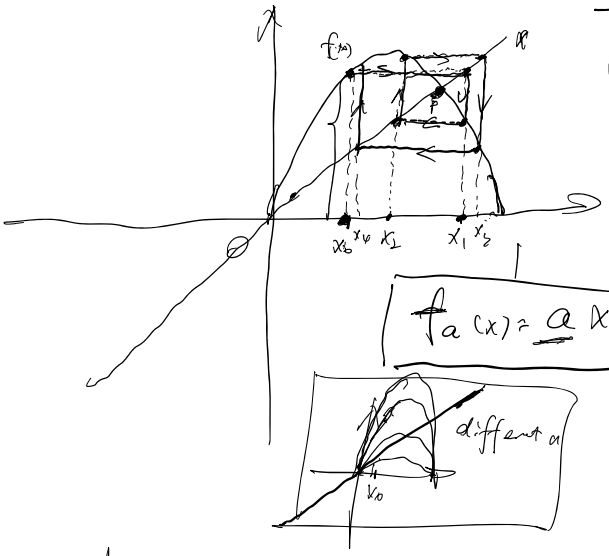


$$x_{n+1} = x_n(1 - x_n) \quad \textcircled{1}$$

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

$x_1 = f(x_0)$

$x_2 = f(x_1)$



$$f_a(x) = a\,x(1-x)$$

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