1- Similar to the proof of Taylor expansion, find the first 3 terms of $f(x)=e^x$ around zero. Hint: start with $\int_0^x e^x dx = e^x - e^0$

2- Use expansion of $e^x = \sum_1^\infty \frac{x^n}{n!}$ to explain the expansions for $Sinx,\ \ Cosx$. Clearly explain the sign changes in the alternative terms.

3- Prove that hyper-harmonic series $\sum_1 \frac{1}{n^p}$ converges if $p>1$

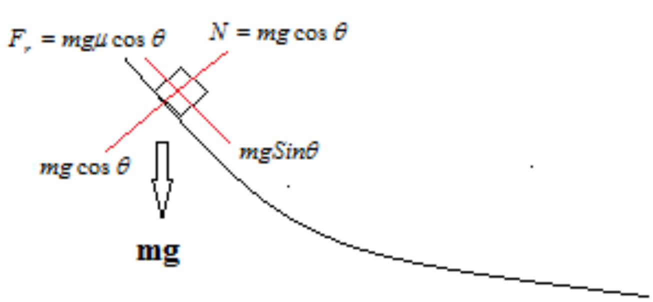
4- Show that $\sum_0^n \frac{(-1)^n}{2n+1}$ converges conditionally and then find the value of the sum

5-Show that $\sum_0^n \frac{(-1)^n n}{2^n(2n+1)}$ converges absolutely and then find the value of the sum

6-Solve the DE $\frac{dy}{dx}-2y=-2$ at point $(0,3)$ by series solution. Find the compact form of the solution and then find the function that satisfies the solution.

7-What is (are) the point(s) on any differentiable function (Curve) that the curvature is maximum? Show it mathematically

8-A box $(weight=10N)$ is sliding down on a track ($y=1/x$) from $x=1\ \ to\ \ x=2$. If the track coefficient of friction is $\mu_k=0.1$, what is the value of frictional force at $x=2$? Hint: consider the curvature of the curve at $x=2$



9- From the definition of Binormal $\vec{T}\times\vec{N}=\vec{B}$, show that $\vec{T}=\vec{N}\times\vec{B}$ and $\vec{N}=\vec{B}\times\vec{T}$ and from $\vec{T}=\vec{N}\times\vec{B}$ and $\vec{N}=\vec{B}\times\vec{T}$ show that $\vec{T}\times\vec{N}=\vec{B}$ Use properties of cross product.