*quiz # 1*

**Exercise 1** *(10 points)* Find the limit of the following **sequences**:

a) $\dfrac{n^2}{2n+1}\sin(3/n)$ 　　　 b) $\dfrac{n^n+1}{2^n+n!}$ 　　　 c) $\left(1+\frac{1}{3n}\right)^{2n}$

**Exercise 2** *(35 points)* Determine if the following **series** converges or diverges **Justify your answers**

a) $\displaystyle\sum_{n=1}^{+\infty}\dfrac{10^n}{(\ln n)^n}$

b) $\displaystyle\sum_{n=1}^{+\infty}\dfrac{1}{n2^n-1}$

c) $\displaystyle\sum_{n=1}^{+\infty}\dfrac{2\cos(n!)-1}{n(n+1)}$

d) $\displaystyle\sum_{n=2}^{+\infty}\dfrac{\ln(1+e^{3n^2})}{n\sqrt{n}}$

e) $\displaystyle\sum_{n=1}^{+\infty}(e^{2/n}-1)$

**Exercise 3** *(20 points)* a) Find the interval of convergence of the power series

$$\sum_{n=1}^{+\infty}\dfrac{(-1)^{n-1}}{n4^n}(3x-1)^{2n}$$

*(do not forget to check at the end points)*

b) For what value(s) of $x$ the series converges absolutely ? conditionally ?

**Exercise 4** *(15 points)* Let $f(x)=\dfrac{x-1}{3+2x}$. Find the Taylor series of $f$ about $x=1$, then find $f^{(101)}(1)$

**Exercise 5** *(10 points)* Find the following limit: $\displaystyle\lim_{x\to 0}\dfrac{\cos(\sqrt{x})-1+\frac{x}{2}}{3x^2}$

**Exercise 6** *(10 points)* By using the Maclaurin series of $\ln(1+x)$, give an estimate of $\ln(1.1)$ with an error of magnitude less than $10^{-3}$