Mathe 1 - schriftliche Prüfung - 13.6.2002

(Prof. Langer - alter Studienplan)

1.) $\int_0^\infty \frac{x}{1+x^4}\,dx$

Substitution:

$x^2 = u$

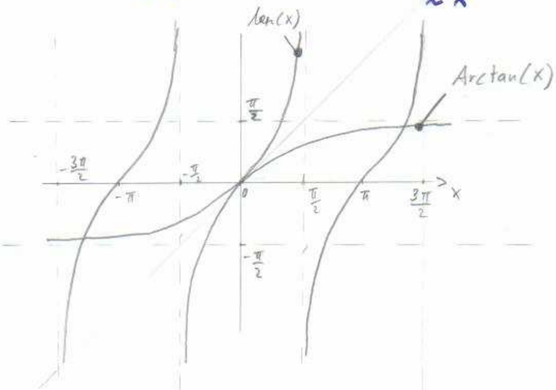
$\frac{du}{dx} = 2x \Rightarrow dx = \frac{du}{2x}$

$= \frac{1}{2}\int_0^\infty \frac{1}{1+u^2}\,du = \frac{1}{2}\arctan(u) + C_1 \Big|_0^\infty =$

$= \frac{1}{2}\arctan(x^2) + C_1 \Big|_0^\infty =$

$= \frac{1}{2}\left(\frac{\pi}{2} - 0\right) + C_1 =$

$= \underline{\underline{\frac{\pi}{4} + C_1}}$



2.) Konvergenzradius R von $\sum_{n=1}^\infty \frac{((n-2)!)^3 \cdot x^n}{(3n+5)!}$

$R = \lim_{k\to\infty} \left|\frac{a_k}{a_{k+1}}\right| \qquad a_n = \frac{((n-2)!)^3}{(3n+5)!}$

$R = \lim_{n\to\infty} \left|\frac{a_n}{a_{n+1}}\right| \stackrel{\lim_{n\to\infty}}{=} \left|\frac{\frac{((n-2)!)^3}{(3n+5)!}}{\frac{((n-1)!)^3}{(3n+8)!}}\right| = \lim_{n\to\infty}\left|\frac{((n-2)!)^3}{((n-1)!)^3}\,\frac{(3n+8)!}{(3n+5)!}\right| =$

$= \lim_{n\to\infty}\left|\frac{(3n+6)(3n+7)(3n+8)}{(n-1)^3}\right| = \lim_{n\to\infty}\left|\frac{\cancel{n^3}(3+\frac{6}{n})(3+\frac{7}{n})(3+\frac{8}{n})}{\cancel{n^3}(1-\frac{1}{n})^3}\right| =$

$= \underline{\underline{27}}$

Falls Ihr weitere Fragen gesammelt habt, schickt sie mir bitte an studenten@entner.net. Danke!