Rješenje prve školske zadaće iz Matematike 3R
Grupe R2, R3, R4, M3R1

14.10.2011.g.

Grupa A

1. (4 boda)
$S(x) = \frac{1}{2}\sin x - \frac{1}{\pi}\sum_{k=0}^{\infty} \frac{4(2k+1)}{1-4(2k+1)^2}\sin\left((4k+2)x\right) + \frac{1}{\pi}\sum_{k=1}^{\infty}\frac{8k}{1-16k^2}\sin\left(4kx\right)$

2. (4 boda) $\tilde{f}(x) = \frac{2}{\pi}\int_0^{\infty}\frac{1-\cos(2\lambda)-\lambda\sin\lambda}{\lambda^2}\cos(\lambda x)d\lambda$
$1 = f(0) = \tilde{f}(0) = \frac{2}{\pi}\int_0^{\infty}\frac{1-\cos(2\lambda)-\lambda\sin\lambda}{\lambda^2}d\lambda = \frac{2}{\pi}I \Longrightarrow I = \frac{\pi}{2}$

3. (2 boda) Funkcije $f(x) = \mathrm{tg}(x)$ ne zadovoljava Dirichletove uvjete na $[0,\pi]$ jer ima prekid druge vrste u $\frac{\pi}{2}$.

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Grupa B

1. (4 boda) $S(x) = \frac{\pi}{2} + (1-\frac{4}{\pi})\cos x - \frac{4}{\pi}\sum_{k=2}^{\infty}\frac{1}{(2k-1)^2}\cos\left((2k-1)x\right)$
$1 = f(0) = S(0) = \frac{\pi}{2} - \frac{4}{\pi}\sum_{n=1}^{\infty}\frac{1}{(2n-1)^2} + 1$
$\sum_{n=0}^{\infty}\frac{1}{(2n+1)^2} = \frac{\pi^2}{8}$

2. (4 boda) $\tilde{f}(x) = \frac{2}{\pi}\int_0^{\infty}\frac{1}{\lambda^3}\left(2\lambda^2\sin\lambda + 2\lambda\cos\lambda - 2\sin\lambda\right)\cos(\lambda x)d\lambda$

3. (2 boda) Funkcije $f(x) = x$ i $g(x) = x^2$ su ortogonalne na intervalu $[-1,1]$, ali ne i na $[-1,2]$.