Matematiska Vetenskaper, Chalmers Tekniska Högskola & Göteborgs Universitet

Tentamen i **Fourier- och Waveletanalys**, 2006-12-21, kl 1400-1900.

Hjälpmedel: Kurslitteratur, anteckningar och valfri räknare.

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1.Express $D(g\delta)(\varphi)$ in values of g and φ only. Here g is an admissible function and $\varphi \in \mathcal{S}$. (6 p)

2. Detemine the Hilbert transform of the function $f(x) = \sin x + \cos x$, and the analytic function of which f is the real part. (6 p)

3. Show that, for the low pass filter function H with real coefficients in an orthogonal MRA, $|H(\pi/2)| = 1/\sqrt{2}$. (6 p)

4. Let ψ be the wavelet in an orthogonal MRA. Prove that, for $\hat{f} = 1_{(a,b)}$ & $(a, b) \subset (0, 2\pi)$,

$$(2\pi)^{-1} \int |\hat{f}(\omega)|^2 |\hat{\psi}(\omega)|^2 \, d\omega = \sum_k | < f, \psi_{0\,k} > |^2$$

holds. (A consequence of this result is that the equality holds for all $f \in L^2$, and for any scale j.) (7 p)

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