

Assignment Quiz 1
January 21, 2003

Instructor: B.L. Daku
Time: 10 minutes
Aids: None

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Name:
Student Number:

1. Determine the constant β , where

$$\beta = \frac{\cos(\omega_0(n+1)) + \cos(\omega_0(n-1))}{\cos(\omega_0 n)}$$

What could this expression be used for if you were given three consecutive samples of a discrete-time signal?

to get ω_0

$$= \frac{\frac{1}{2} (e^{j\omega_0(n+1)} + e^{-j\omega_0(n+1)}) + \frac{1}{2} (e^{j\omega_0(n-1)} + e^{-j\omega_0(n-1)})}{\frac{1}{2} (e^{j\omega_0 n} + e^{-j\omega_0 n})}$$

$$= \frac{e^{j\omega_0 n} e^{j\omega_0} + e^{-j\omega_0 n} e^{-j\omega_0} + e^{j\omega_0 n} e^{-j\omega_0} + e^{-j\omega_0 n} e^{j\omega_0}}{e^{j\omega_0 n} + e^{-j\omega_0 n}}$$

$$= \frac{e^{2j\omega_0 n} [e^{j\omega_0} + e^{-j\omega_0}] + [e^{j\omega_0} + e^{-j\omega_0}] e^{j\omega_0 n}}{e^{j\omega_0 n} + e^{-j\omega_0 n}}$$

$$e^{2j\omega_0 n} [1 + e^{-2j\omega_0}]$$

$$= \frac{e^{2j\omega_0} [1 + e^{-2j\omega_0}] + [1 + e^{2j\omega_0}] e^{-2j\omega_0}}{[1 + e^{-2j\omega_0}]}$$

$$[1 + e^{-2j\omega_0}]$$

$$= \frac{e^{2j\omega_0} + e^{-2j\omega_0}}{1 + e^{-2j\omega_0}}$$

$$= \frac{2\cos(2\omega_0)}{1 + \cos(2\omega_0)} = \beta$$