EECS20n, Quiz 4 Solution, 4/14/00

1. The fundamental frequency $\omega_0 = \pi/2$, in units of radians per sample. To get the Fourier series coefficients, just write the signal as a sum of complex exponentials,

$$x(n) = (1/2)e^{-i\pi n} + (i/2)e^{-i\pi n/2} + 2 - (i/2)e^{i\pi n/2} + (1/2)e^{-i\pi n},$$

from which we can read off the coefficients,

$$
\begin{aligned}
X_{-2} &= 1/2 \\
X_{-1} &= i/2 \\
X_0 &= 2 \\
X_1 &= -i/2 \\
X_2 &= 1/2.
\end{aligned}
$$

The rest of the coefficients are zero.

2. The Fourier series coefficients of the output will be the above Fourier series coefficients multiplied by $H(\omega)$ for the corresponding value of ω. This yields

$$
\begin{aligned}
y(n) &= -(1/2)e^{-i\pi n} + 2 - (1/2)e^{i\pi n} \\
&= 2 - \cos(\pi n).
\end{aligned}
$$