**Problem 6.41**   The program `P6.41.m` on the website generates a triangle wave and adds noise to it. It also generates a resonator filter that enhances three of the triangle wave harmonics. The user must input the real part a of the poles. Determine the value of a that maximizes the selectivity of the resonator, while keeping the duration of the impulse response to within ≈ 1 s. Plot:

(a) The noisy triangle wave and its spectrum

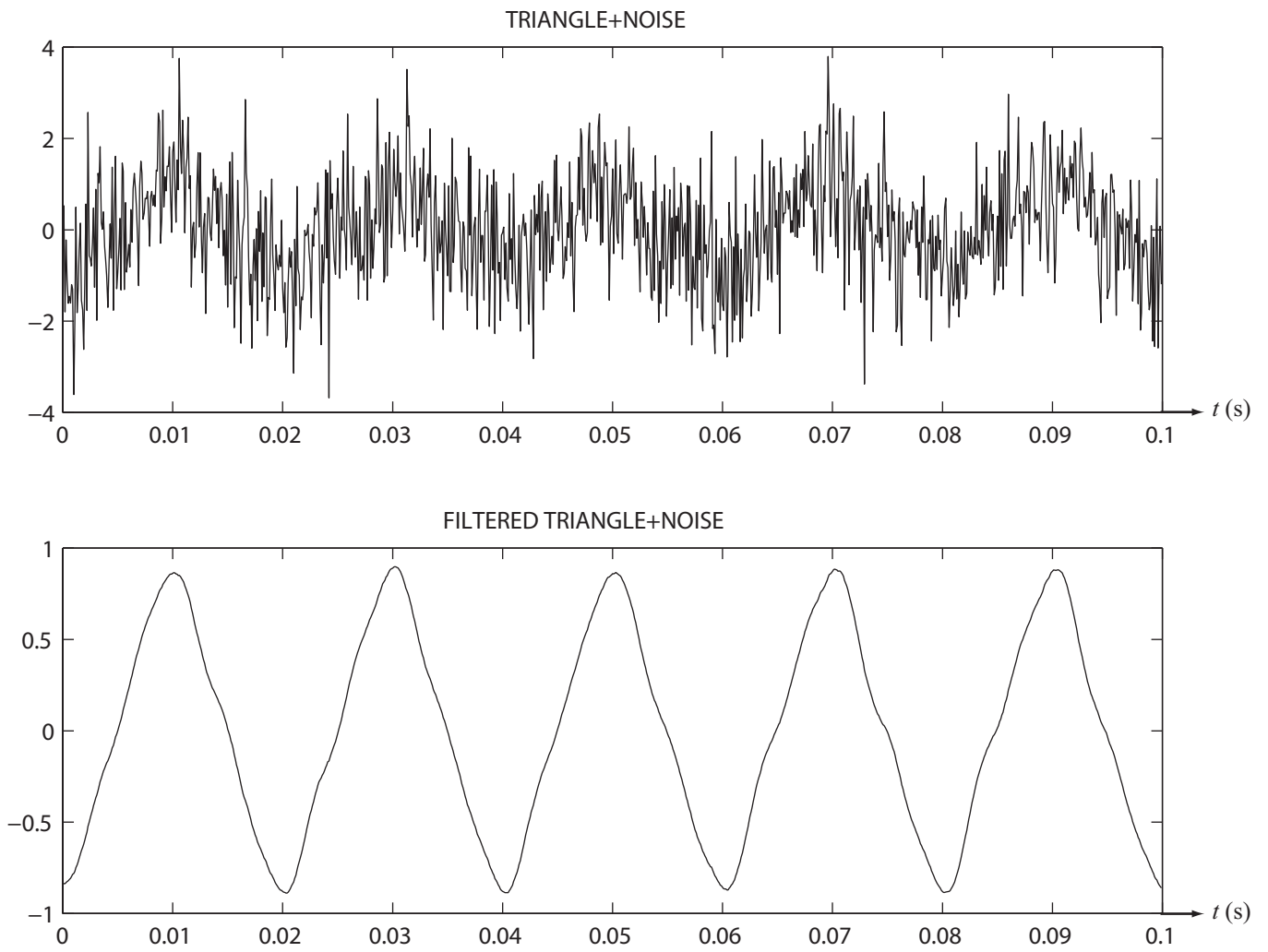(b) The impulse and frequency responses of the filter

(c) The filtered signal.

Solution: Using the real part of the poles $a = -5$ gives
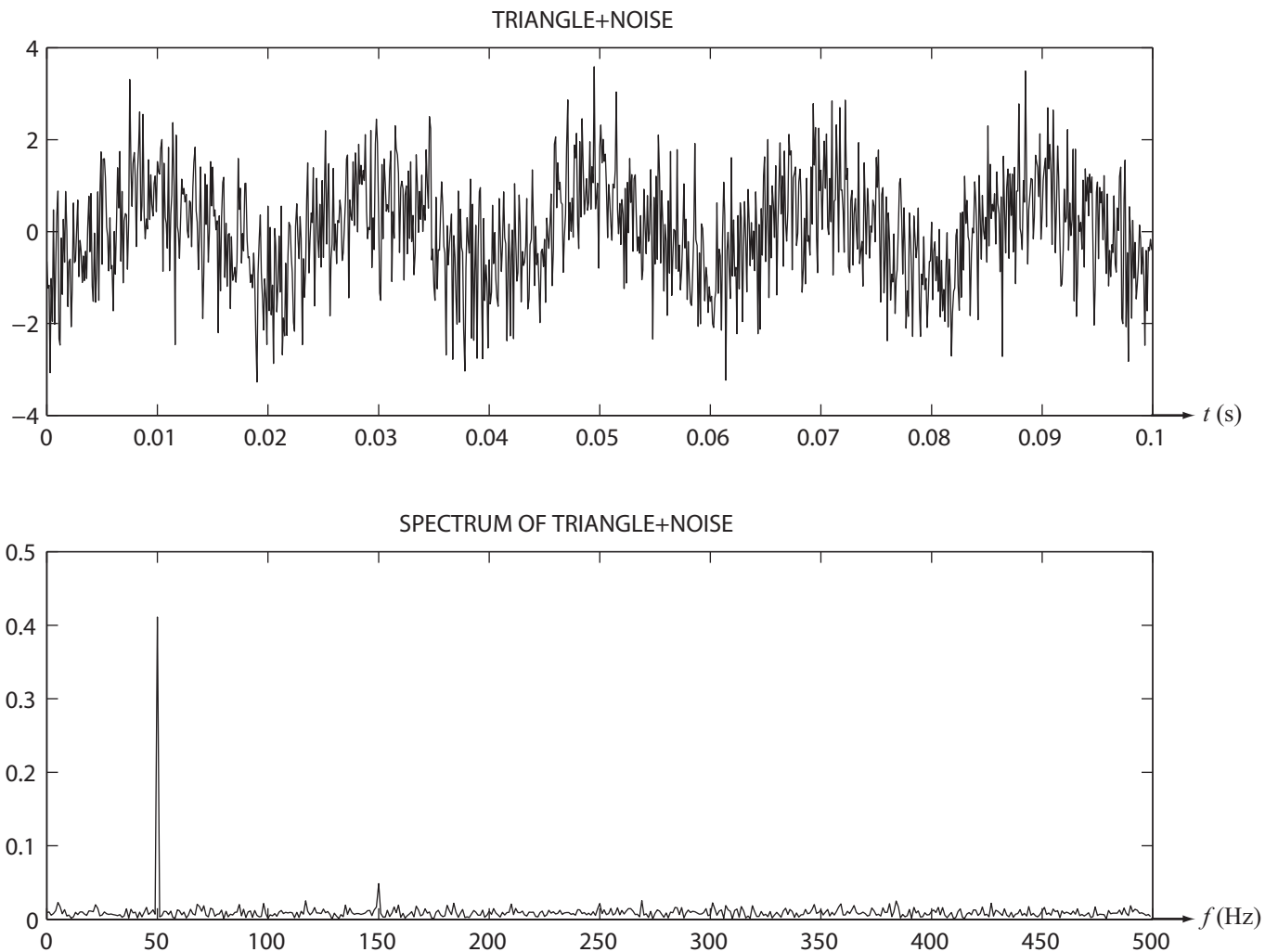
The triangle-plus-noise signal and its spectrum

IMPULSE RESPONSE OF RESONATOR FILTER

$h(t)$
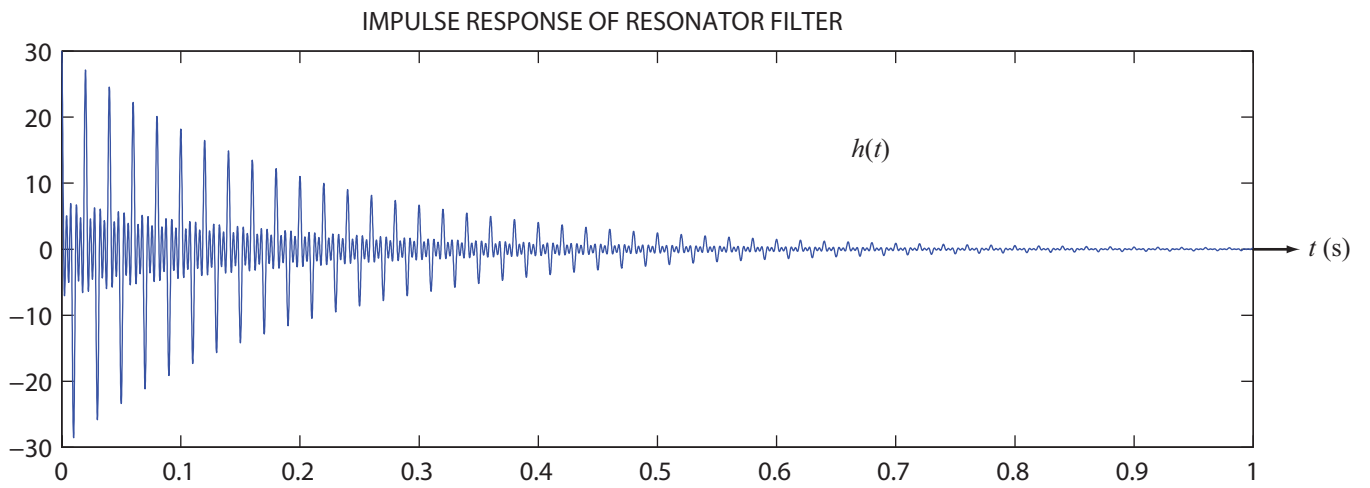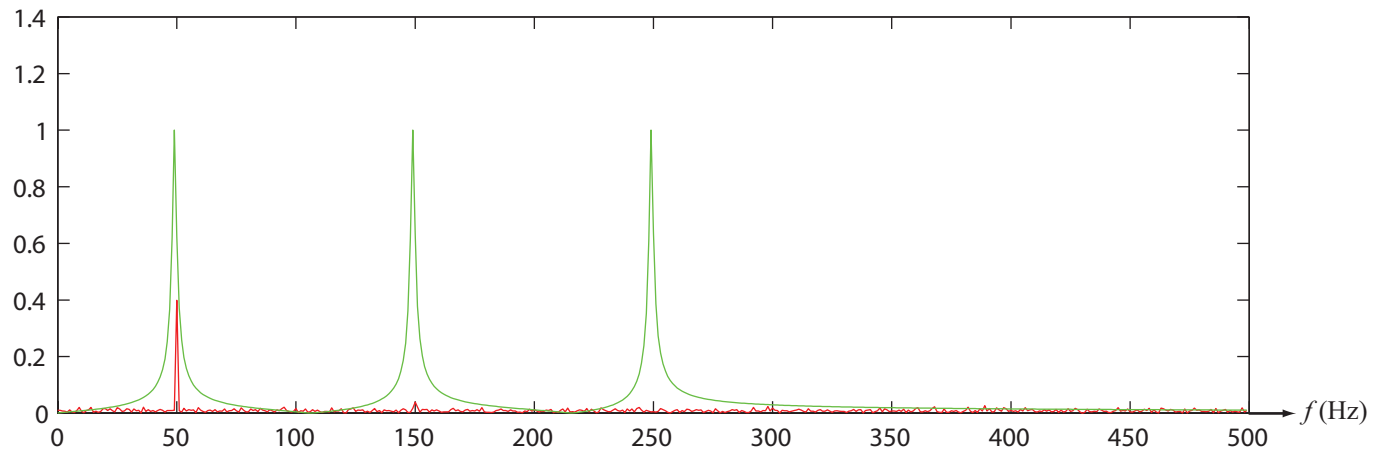
The resonator filter frequency and impulse responses

TRIANGLE+NOISE

FILTERED TRIANGLE+NOISE

The original and filtered signals