97. The siren is between you and the cliff, moving away from you and towards the cliff. Both "detectors" (you and the cliff) are stationary, so $v_D = 0$ in Eq. 18-47 (and see the discussion in the textbook immediately after that equation regarding the selection of $\pm$ signs). The source is the siren with $v_S = 10$ m/s. The problem asks us to use $v = 330$ m/s for the speed of sound.

(a) With $f = 1000$ Hz, the frequency f_y you hear becomes

$$f_y = f\left(\frac{v+0}{v+v_S}\right) = 970.6 \approx 9.7 \times 10^2 \text{ Hz} .$$

(b) The frequency heard by an observer at the cliff (and thus the frequency of the sound reflected by the cliff, ultimately reaching your ears at some distance from the cliff) is

$$f_c = f\left(\frac{v+0}{v-v_S}\right) = 1031.3 \approx 1.03 \times 10^2 \text{ Hz} .$$

(c) The beat frequency is $f_c - f_y = 61$ beats/s (which, due to specific features of the human ear, is too large to be perceptible).