76. (a) With $\lambda = 0.5\,\mu$m, Eq. 36-14 leads to

$$\theta = \sin^{-1}\frac{(3)(0.5\,\mu\text{m})}{2.00\,\mu\text{m}} = 48.6^\circ\ .$$

(b) Decreasing the frequency means increasing the wavelength – which implies $y$ increases. Qualitatively, this is easily seen with Eq. 36-17. One should exercise caution in appealing to Eq. 36-17 here, due to the fact the small angle approximation is not justified in this problem. The new wavelength is $0.5/0.9 = 0.556\,\mu$m, which produces a new angle of

$$\theta = \sin^{-1}\frac{(3)(0.556\,\mu\text{m})}{2.00\,\mu\text{m}} = 56.4^\circ\ .$$

Using $y = D\tan\theta$ for the old and new angles, and subtracting, we find

$$\Delta y = D\,(\tan 56.4^\circ - \tan 48.6^\circ) = 1.49\text{ m}\ .$$