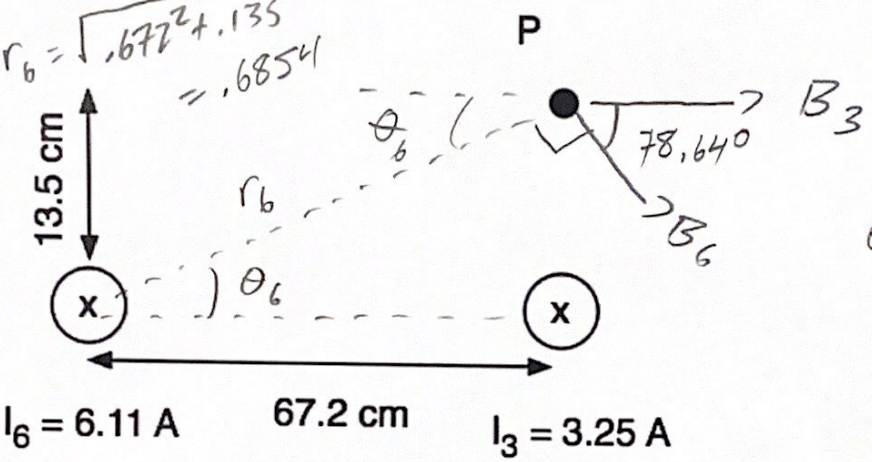
Quiz 21.2B

Two parallel wires are separated by 67.2 cm as shown below. Wire I_3 carries a current of 3.25 Amps. Wire I_6 carries a current of 6.11 Amps.

a) Find the magnitude and direction of the total magnetic field at point P due to these two wires.

b) If a proton is located at point P and has a velocity of 3.85×10^6 m/s in a direction into the page, what will be the magnitude and direction of the magnetic force it feels?

$r_6 = \sqrt{.672^2 + .135^2} = .6854$



$\theta_6 = \tan^{-1}\left(\frac{.135}{.672}\right) = 11.36°$

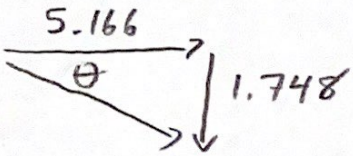
$|B_3| = \frac{(2\times10^{-7})(3.25)}{.135} = 4.815\ \mu T$, $+x$

$|B_6| = \frac{(2\times10^{-7})(6.11)}{.6854} = 1.783\ \mu T$, $78.64°$ below $+x$

$B_{3x} = 4.815 \quad B_{3y} = 0$

$B_{6x} = 0.351 \quad B_{6y} = -1.748$

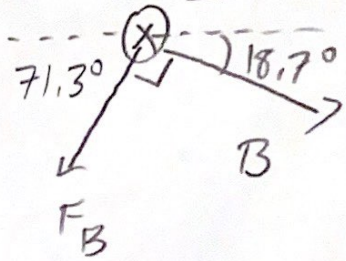
$B_{TOT} = 5.166 \quad -1.748$



$B_{TOT} = \sqrt{5.166^2 + 1.748^2} = \boxed{5.45\ \mu T}$

$\theta = \tan^{-1}\left(\frac{1.748}{5.166}\right) = \boxed{18.7° \text{ below } +x}$

RHR #1



$|F_B| = qvB\sin\theta$

$= (1.6\times10^{-19})(3.85\times10^{6})(5.45\times10^{-6})\sin 90°$

$= \boxed{3.36\times10^{-18}\ N}$, $\boxed{71.3° \text{ below } -x}$