Physics 2BL: Homework Set 04
Taylor Problems: 6.4, 7.2

6.4

(a) DENSITY OF TRACKS (TRACKS/CM^2) {11, 9, 13, 15, 8, 10, 5, 11, 9, 12, 12, 13, 9, 14}
MEAN (TRACKS/CM^2) = 10.7857
STANDARD DEVIATION (TRACKS/CM^2) = 2.6654

(b)

$$n_{EXPECTED} = N \times PROB(OUTSIDE \cdot t_{SUSPECT}\sigma)$$

$$t_{SUSPECT} = \frac{|5 - 10.7857|}{2.6654} = 2.17$$

$$n_{EXPECTED} = 14(1 - 0.97) = 0.42$$

CHAUVENET'S CRITERION IS THAT IF n<0.5, WE MAY REJECT $x_{SUSPECT}$.
THUS WE CAN REJECT THE MEASUREMENT OF 5.

(c) DENSITY OF TRACKS (TRACKS/CM^2) {11, 9, 13, 15, 8, 10, 11, 9, 12, 12, 13, 9, 14}
MEAN (TRACKS/CM^2) = 11.2308
STANDARD DEVIATION (TRACKS/CM^2) = 2.1662

7.2: Mass (MeV/c^2)
1967.0 ± 1.0, 1969.0 ± 1.4, 1972.1 ± 2.5

$$m_{wav} = \Sigma w_i m_i / \Sigma w_i \ , \qquad w_i = 1/\sigma_i^2 \ , \qquad \sigma_{wav} = 1/\sqrt{\Sigma w_i}$$

$$m_{wav} = \frac{(1/1^2)(1967.0) + (1/1.4^2)(1969.0) + (1/2.5^2)(1972.1)}{(1/1^2) + (1/1.4^2) + (1/2.5^2)}$$

$$= \frac{1967.0 + 1004.6 + 315.5}{1 + 0.51 + 0.16} = 1968.1$$

$$\sigma_{wav} = \frac{1}{\sqrt{1 + 0.51 + 0.16}} = 0.77$$

$$\boxed{m_{wav} \pm \sigma_{wav} = 1968.1 \pm 0.8 \text{ MeV/c}^2}$$