Exercise 2.1 (A critical-thinking problem)

The linear-plus-quadratic equations of momentum (1.5) and kinetic energy (2.3a) have two algebraic solutions corresponding to geometric intersections of a momentum-line with kinetic energy ellipse or ellipses. For perfectly elastic (*ka-Bong!*) collisions the solutions are just *INITIAL*(IN) and *FINAL*(FIN), and similarly for perfectly inelastic (*ka-Runch!*) collisions, as shown in Fig. 2.3a and Fig. 2.3c, respectively.

However, for partially elastic (*ka-whump!*) collisions, as shown in Fig. 2.3b, there seem to be four possible intersections. One in particular is labeled as F_{flump} and lies below primary solution point F_{whump}.
(a) Discuss F_{flump} and compare to F_{whump}. Are both physically possible? What situation could possibly give rise to an F_{flump}? Think outside of the box(es) of cars and more in the realm of molecular, atomic, nuclear, and quantum particle collisions.
(b) Now, you could simulate a F_{flump} on *BounceIt*. (That would pretty well take care of this problem!)
See if you can what is going on to have a F_{flump} before trying to do such a simulation.

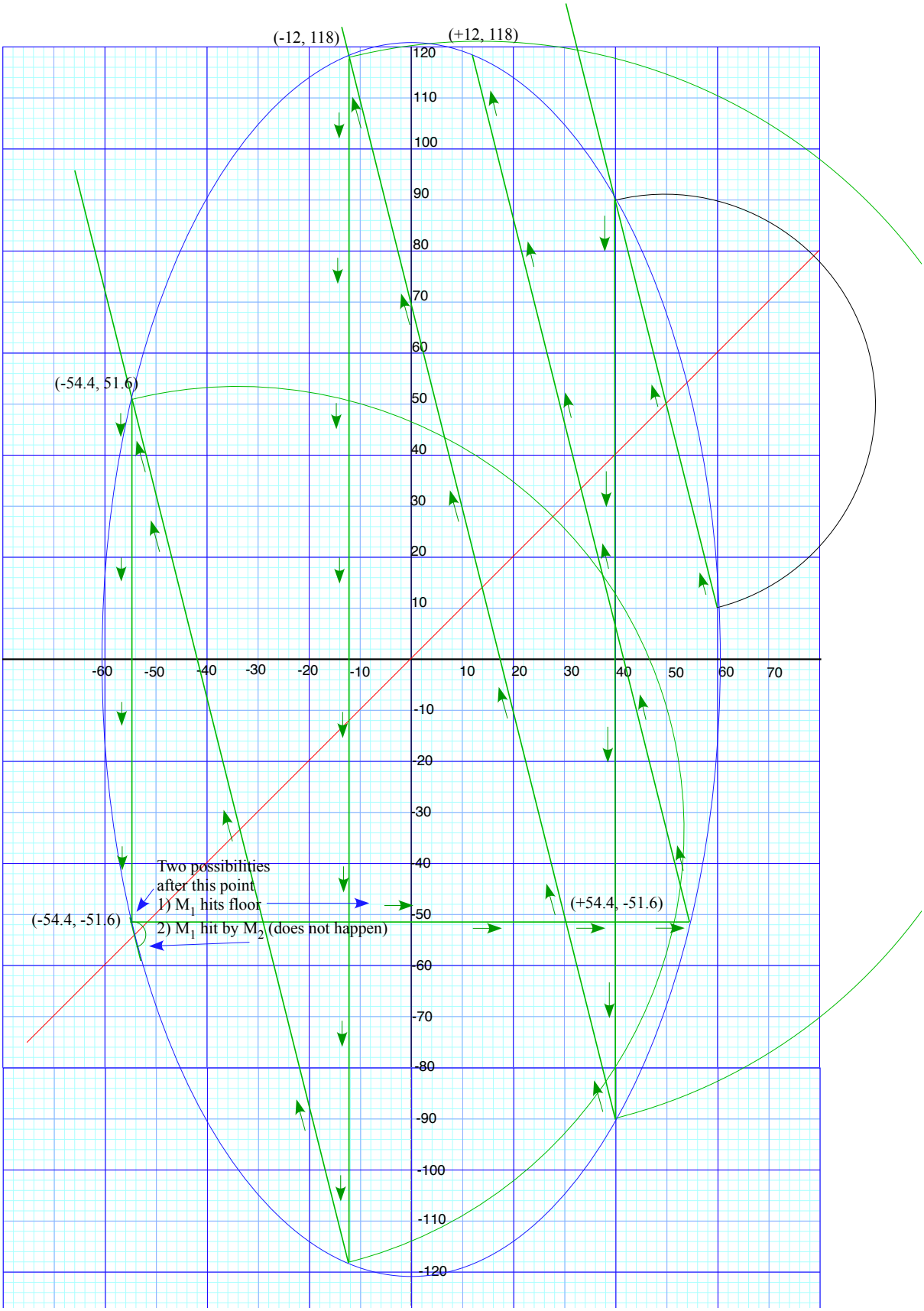
Exercise 2.1 (Using SUV VW graph-paper)

Continue constructions of velocity collision lines for $M_{SUV}=1$ with $M_{VW}=4$ that were started in class with initial conditions $V_{SUV}=60$ and $V_{VW}=10$ in Fig. 2.4a where the cars bounce elastically off each other or off walls at $y_0=0$ and $y_1=7$. (The y_1 value differs from Fig. 2.4 but is default value for simulations.) Construct 6 collisions as precisely as you can.
Use algebra to check the first four $(V_{SUV}^{FIN}, V_{VW}^{FIN})$ values of your constructions

Construct the KE ellipse using method shown in Fig. 2.5. (You should be able to explain this method.) To have room to do construction we recommend graphpaper labeled SUVVWprobGraphpaperToFit8x10R.

Thoughtful question: At the end of collision-6 (VW with y_1-wall) there are two possible paths depending on where the cars are located in position *space* $(y_{SUV}^{FIN}, y_{VW}^{FIN})$. Discuss.

Do any of the preceding $(V_{SUV}^{FIN}, V_{VW}^{FIN})$ suffer from similar ambiguity?


(-12, 118)
(+12, 118)
(-54.4, 51.6)
(-54.4, -51.6)
(+54.4, -51.6)
Two possibilities
after this point
1) M1 hits floor
2) M1 hit by M2 (does not happen)