Action at the Monster Mash

Exercise 1.5.2 The moving ball-wall-trapped-ball constructions in Fig. 5.4 started in class involve a plot of an $M_{Monster} \to \infty$ "ball-wall" coming in with unit slope (velocity) to hit a stationary much smaller m_2. (Again, idealize "balls" as point masses.)

(a) Finish construction started in class as far as you (reasonably) can. (Definition of reason not given!)

(b) Do a construction where $M_{Monster}$ has a velocity of *1/2* and intercepts m_2 when it has velocity *–1* at space-time point *(x=-2, t=4),* that is, *2* units from the fixed wall on the right. Construct six or more back-and-forth collisions. Discuss similarity and differences with Fig. 5.4.

(c) Also, construct one or two *prior* collisions *(*before *t=4)*.

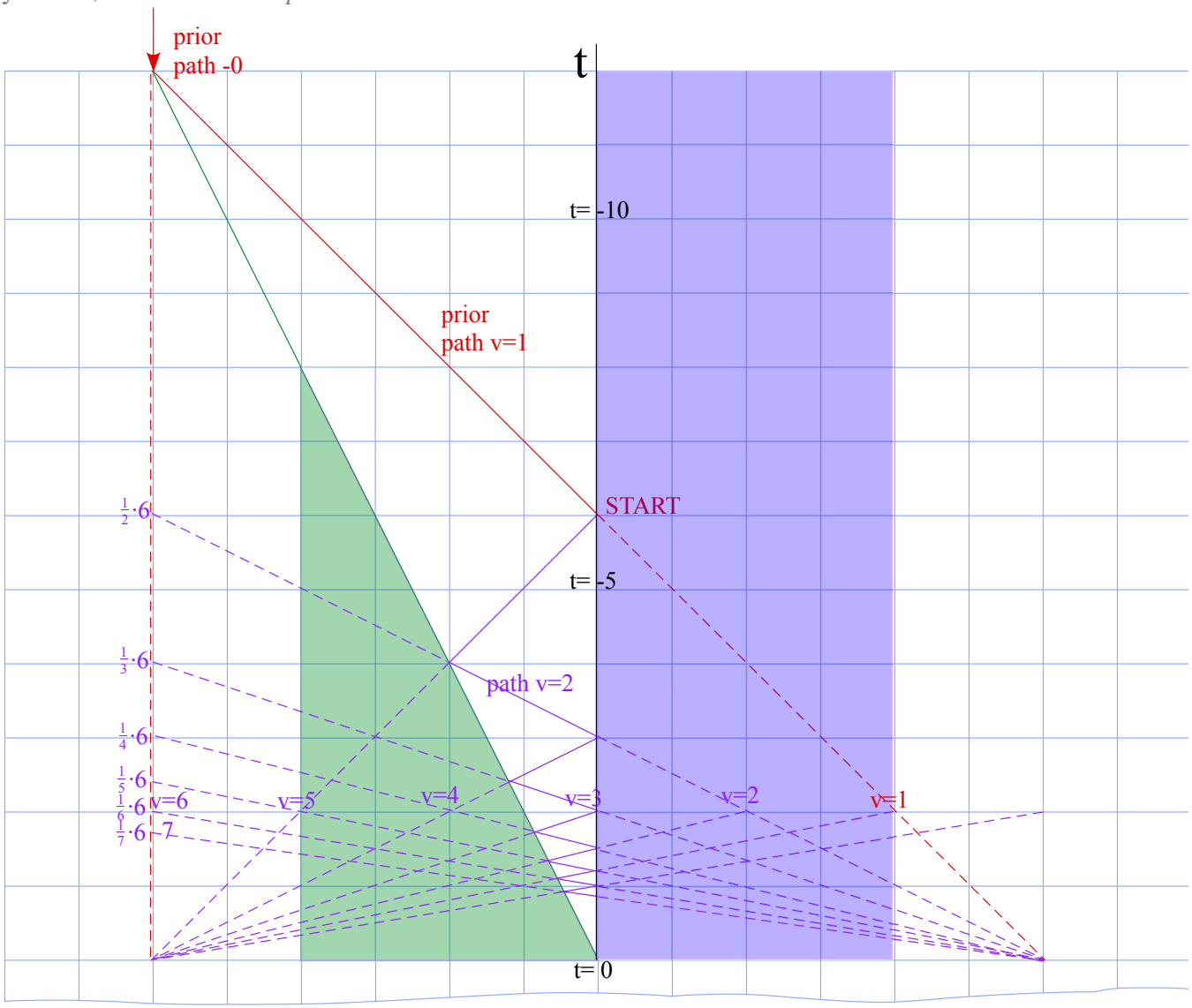
(xtra) Evaluate approximate-average action values as described in class or after Fig. 5.4 in Unit 1.

Ford circles and Farey sums

Exercise 1.5.3 Complete the fraction-geometry construction started in class up to denominator 10. (See also Lect. 5to7 (2.11.16) pages 138-141)

Assignment 3 Solutions (contd.)

Exercise 1.6.2 The moving ballwall-trapped-ball constructions in Fig. 6.4 involves a plot of a ballwall coming in with unit slope (velocity). Consider a construction where it has a velocity of *1/2* and intercepts a trapped ball of velocity *–1* at space-time point *(x=-2, t=-4)* that is *2* units from the fixed wall. Construct five or more back-and-forth collisions and comment on what, if any, differences exist. If you can, also construct a *prior* set of collisions.

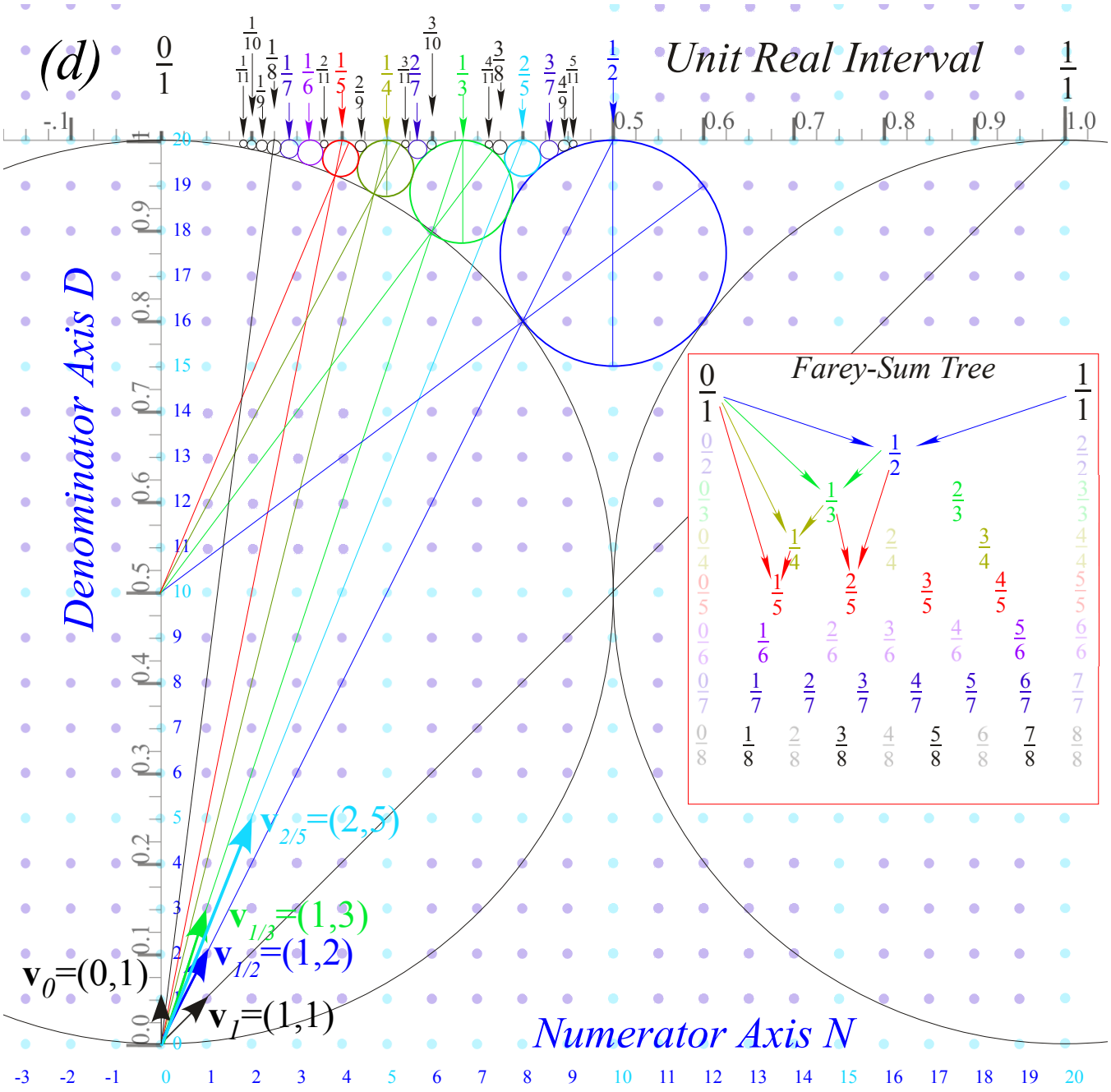


Consider space interval Δx at each wall impact times the velocity Δv of accelerated ball. It does not change.

t=-6 (START) : $(\Delta x=3)\cdot(\Delta v=2|v|=2) = 6$.

t=-3 (LATER) : $(\Delta x=3/2)\cdot(\Delta v=2|v|=4) = 6$.

t=-2 (LATER) : $(\Delta x=1)\cdot(\Delta v=2|v|=6) = 6$.


(d)
Unit Real Interval
Denominator Axis D
Numerator Axis N
Farey-Sum Tree
$\mathbf{v}_0$=(0,1)
$\mathbf{v}_{1/2}$=(1,2)
$\mathbf{v}_{1/3}$=(1,3)
$\mathbf{v}_{2/5}$=(2,5)
$\mathbf{v}_1$=(1,1)