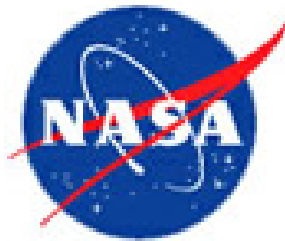


Constant-Velocity Encounter Movie Plots



R. A. Paielli
NASA Ames Research Center

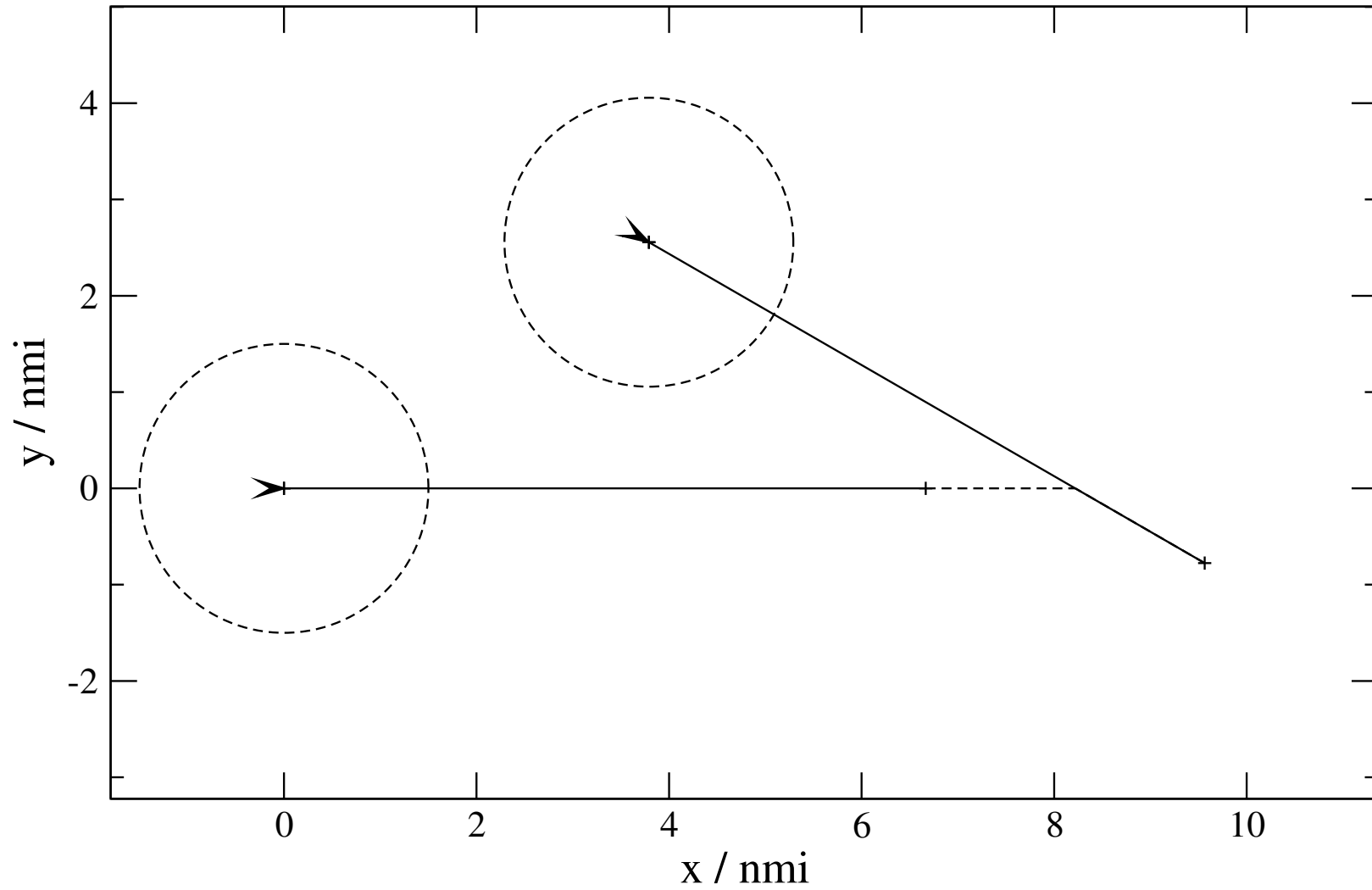
The following plots can be stepped through to simulate a “movie” of the plan-view geometry of an air traffic encounter at constant velocity (i.e., constant speed and direction). The trajectories here are based on idealized velocity vectors with no tolerances and are therefore not representative of trajectory specification, but they are useful for illustrating the basic geometry of air traffic encounters.

The encounter angle for this example is 30 deg, the speeds are 200 knots, and the minimum separation is 3 nmi (nautical miles). The circles are 3 nmi in diameter and are centered at the current position of the flight at each time. The horizontal separation is exactly 3 nmi when the circles touch without overlapping (i.e., are tangent to each other). The time shown in each subtitle is the time relative to the time of minimum separation.

[generated with plot/ConstVelEncounter.scala]

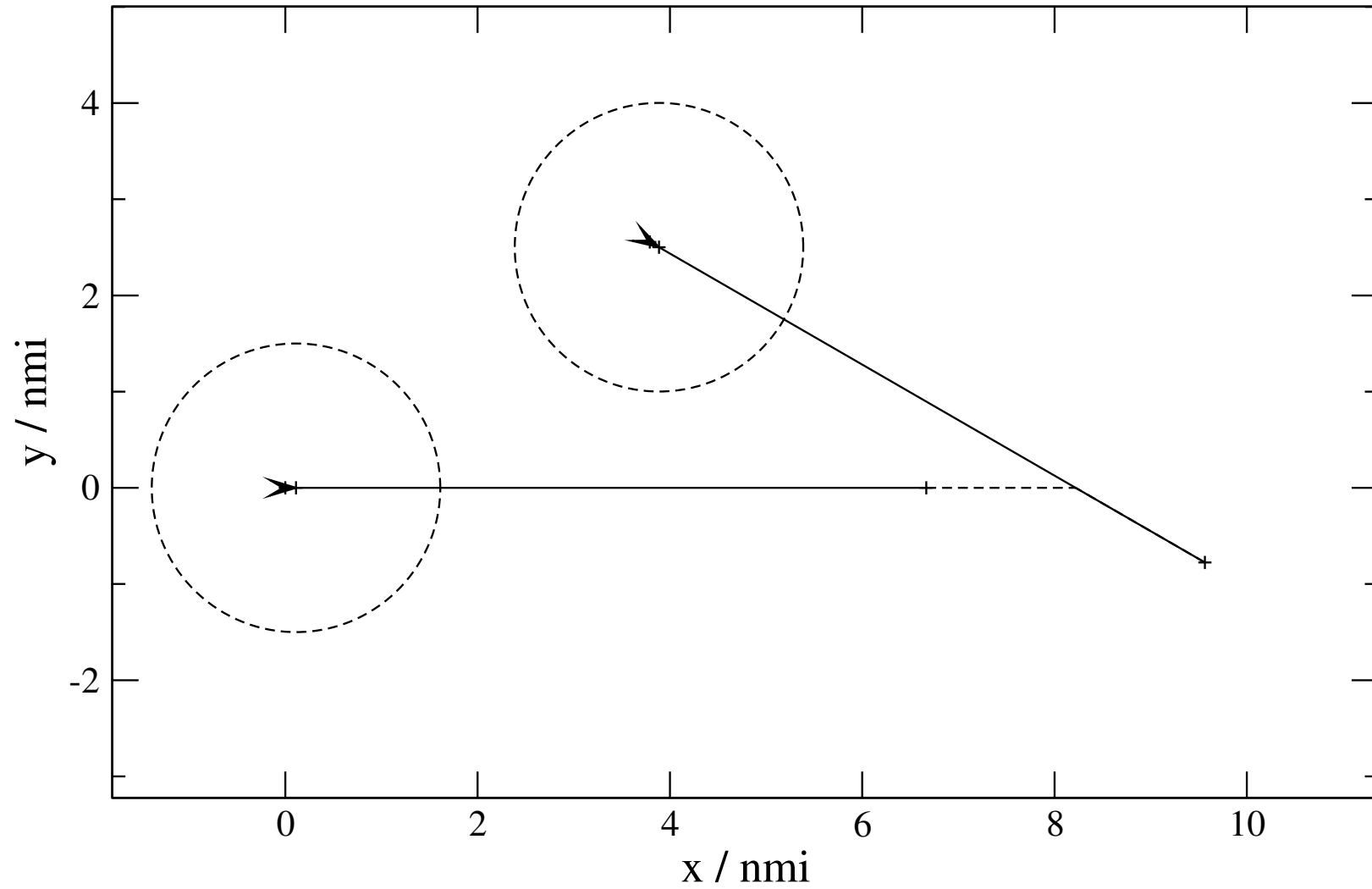
Constant-Velocity Encounter Planview

time: -120.0 sec, angle: 30 deg, min separation: 3.00 nmi



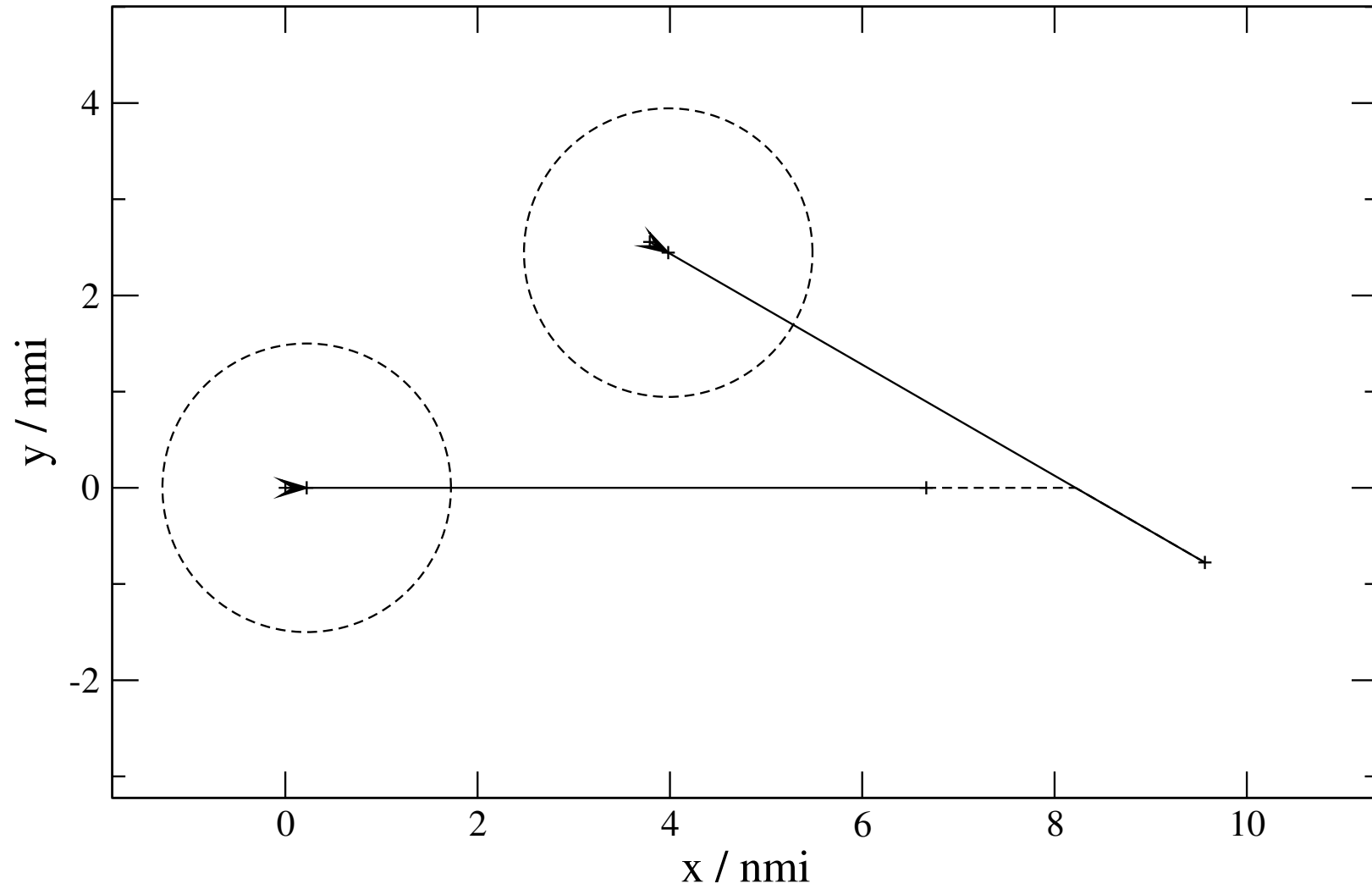
Constant-Velocity Encounter Planview

time: -118.0 sec, angle: 30 deg, min separation: 3.00 nmi



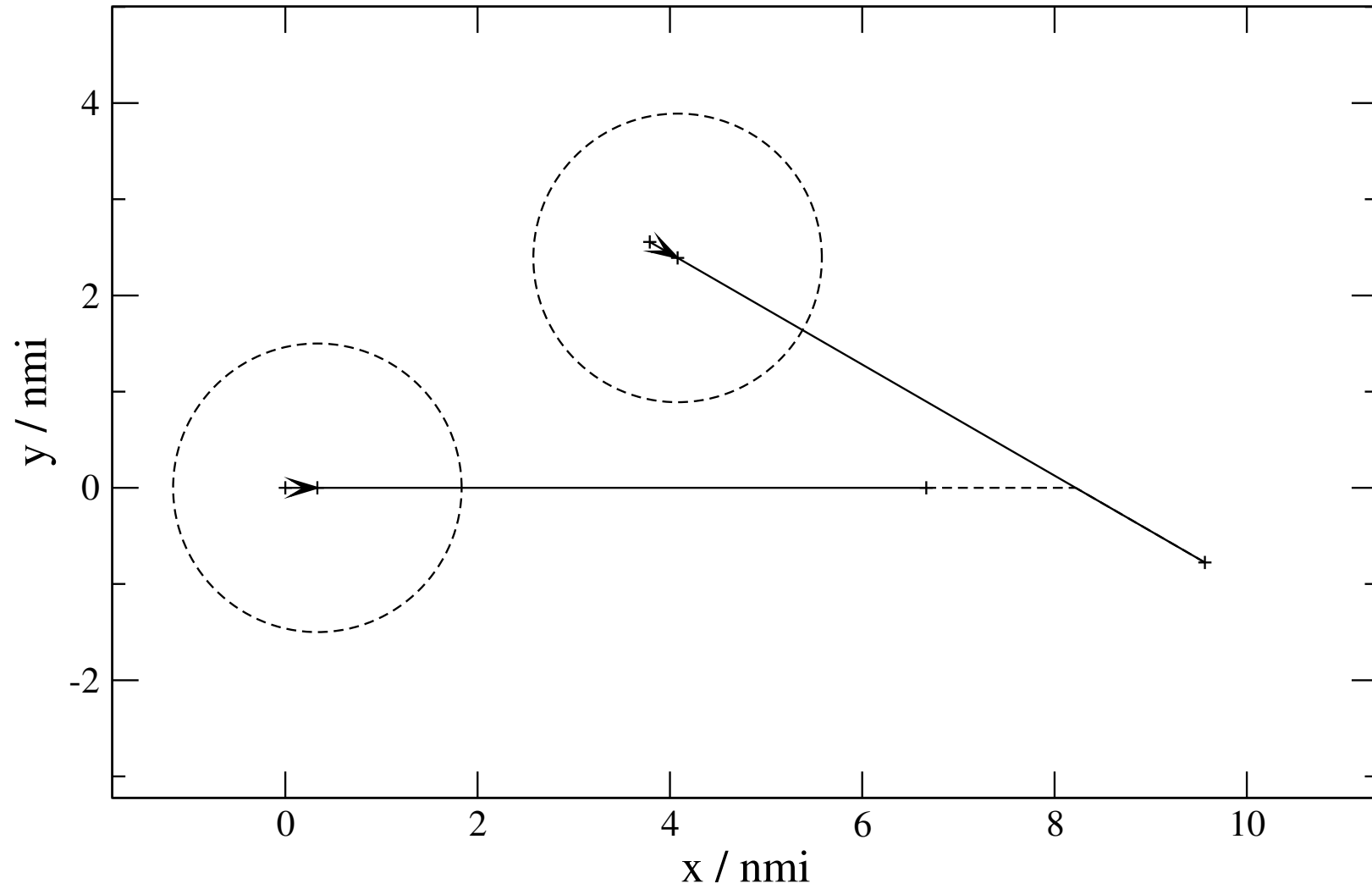
Constant-Velocity Encounter Planview

time: -116.0 sec, angle: 30 deg, min separation: 3.00 nmi



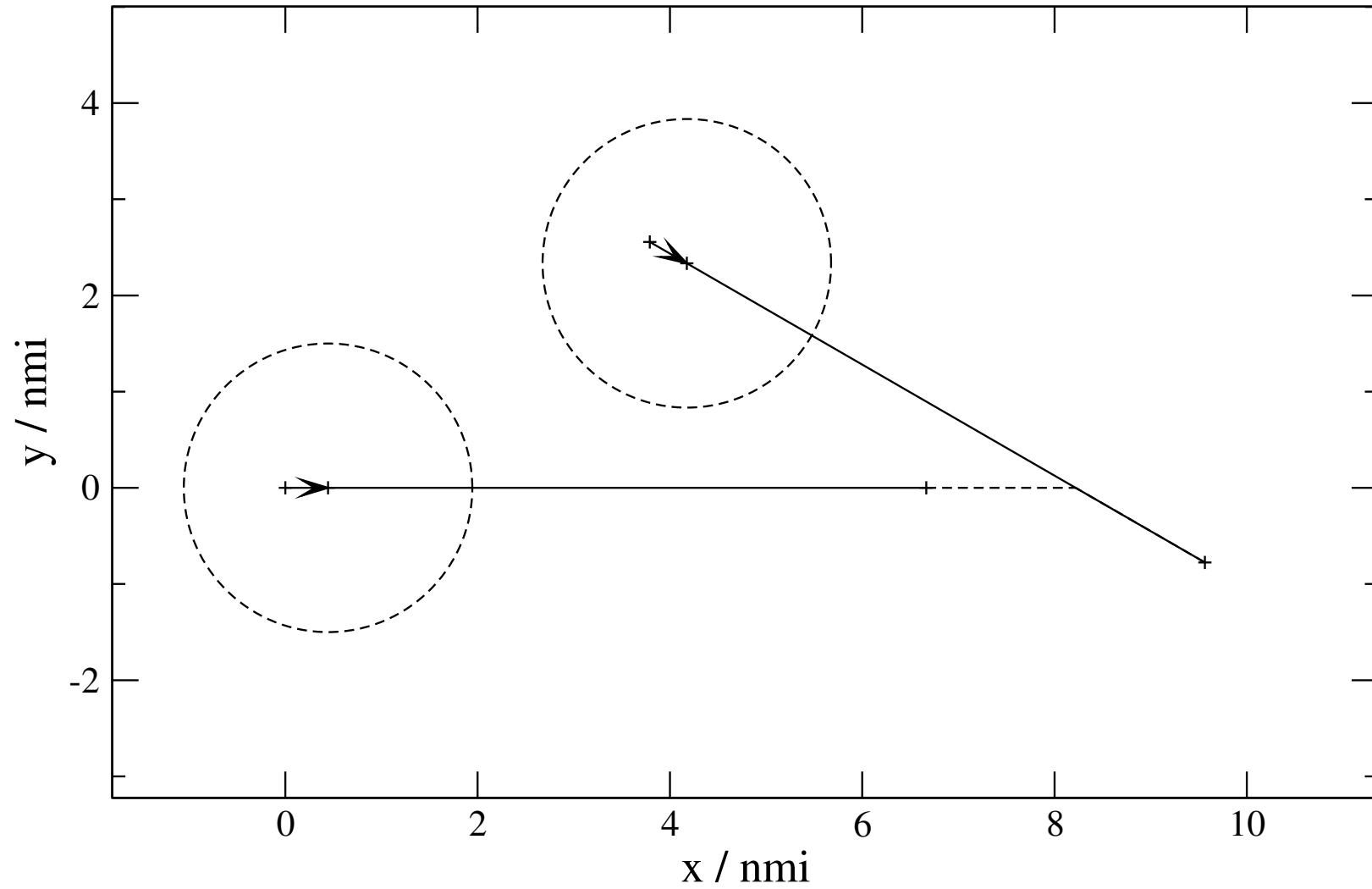
Constant-Velocity Encounter Planview

time: -114.0 sec, angle: 30 deg, min separation: 3.00 nmi



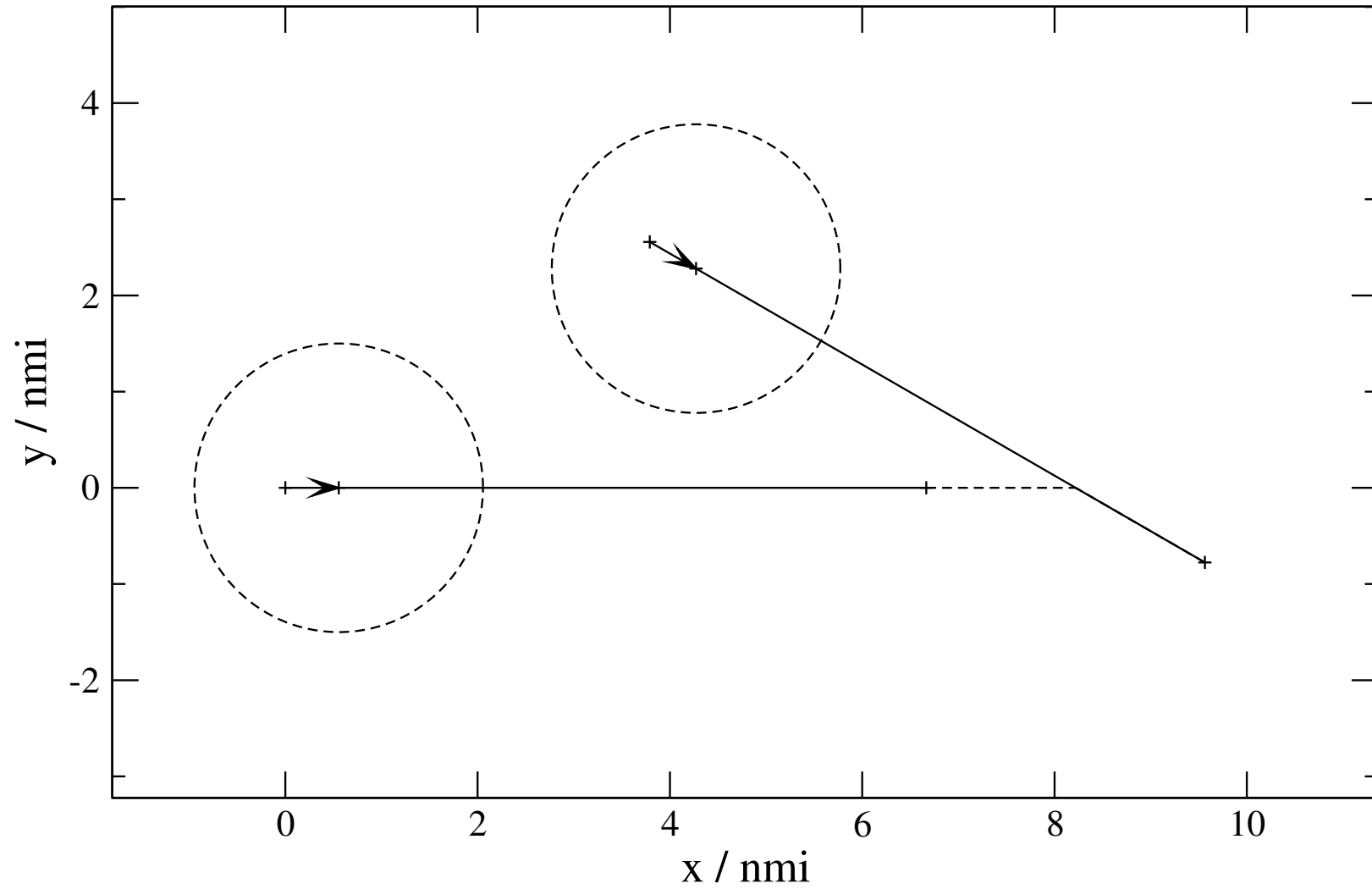
Constant-Velocity Encounter Planview

time: -112.0 sec, angle: 30 deg, min separation: 3.00 nmi



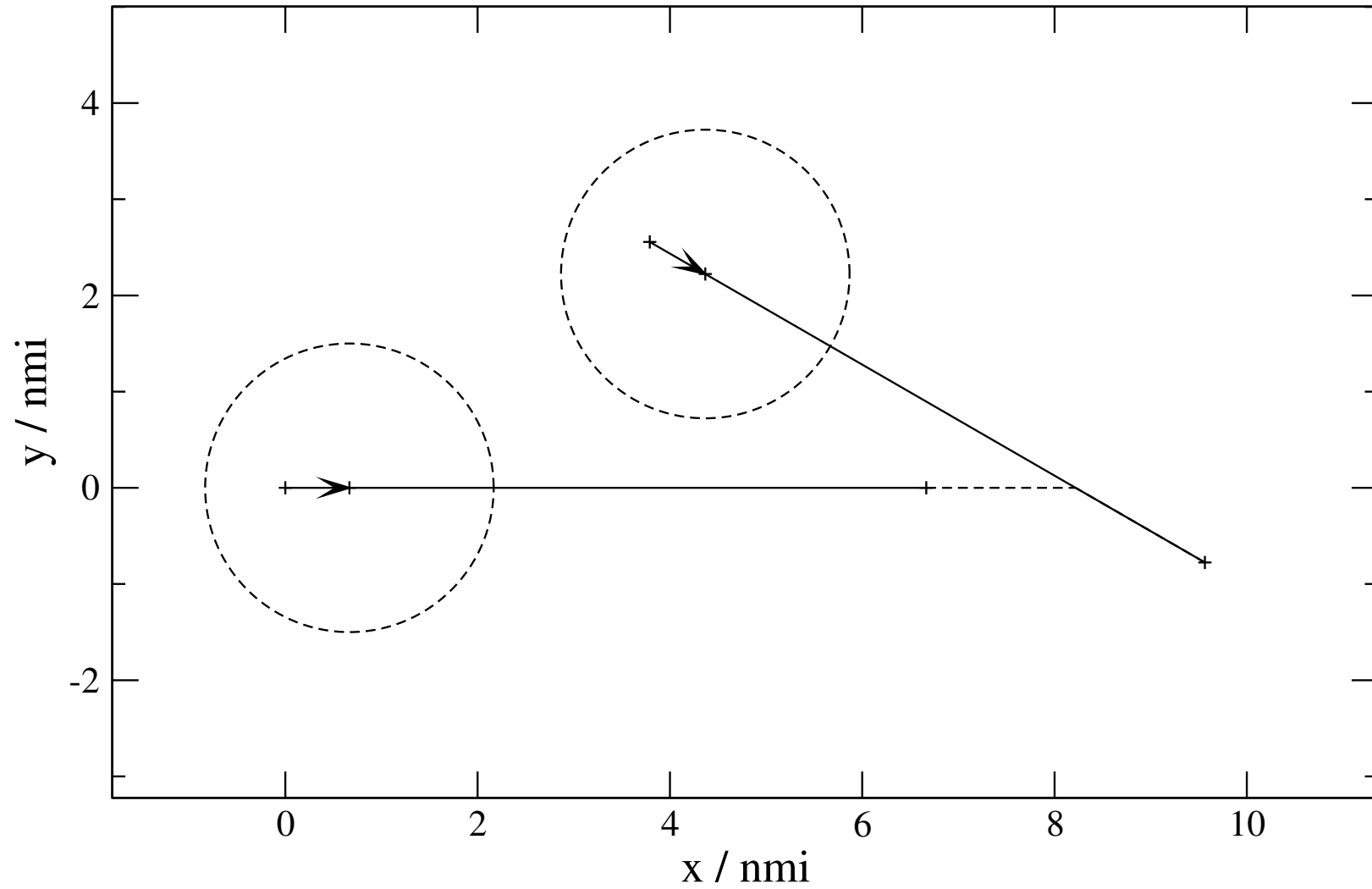
Constant-Velocity Encounter Planview

time: -110.0 sec, angle: 30 deg, min separation: 3.00 nmi



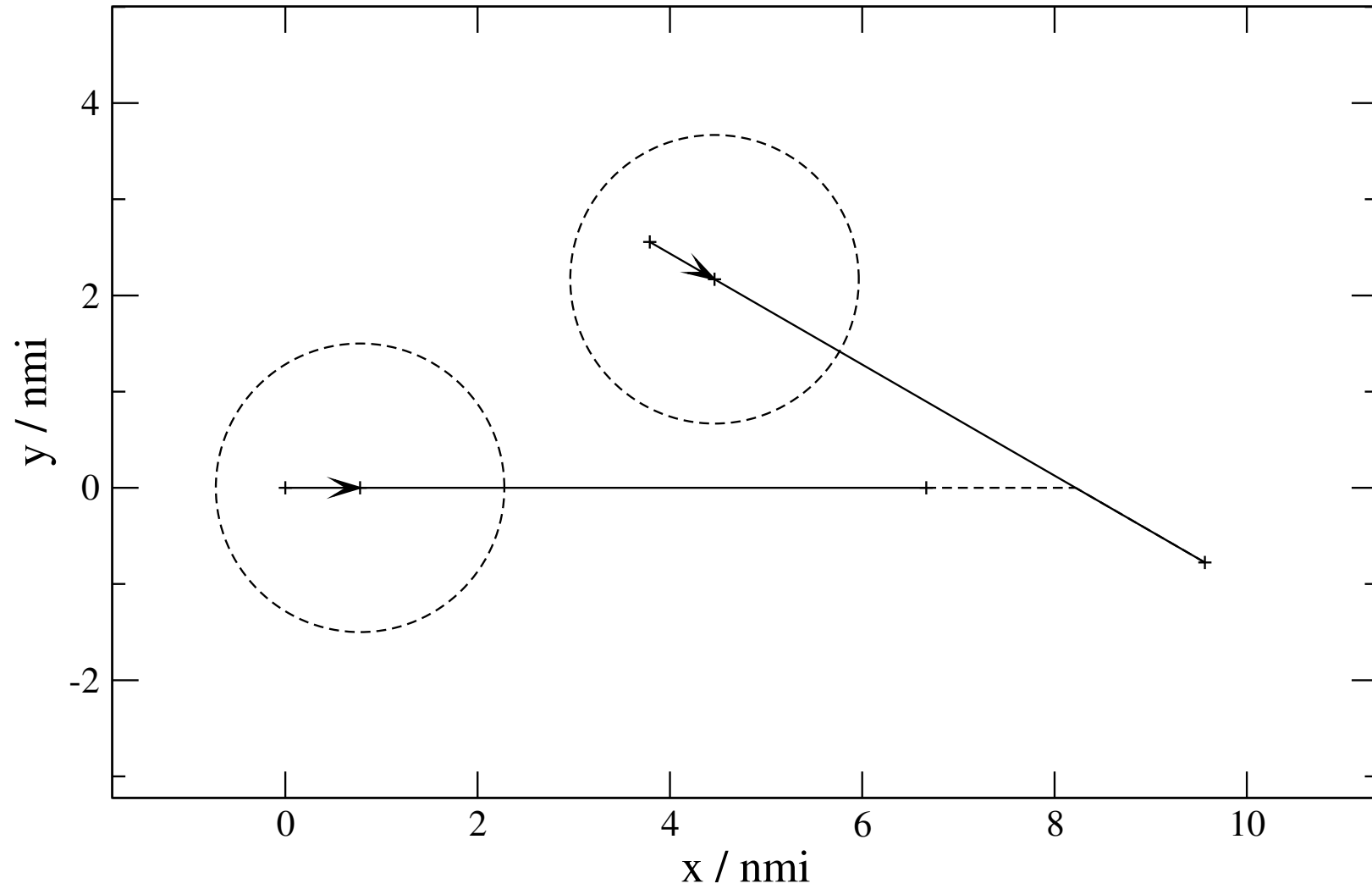
Constant-Velocity Encounter Planview

time: -108.0 sec, angle: 30 deg, min separation: 3.00 nmi



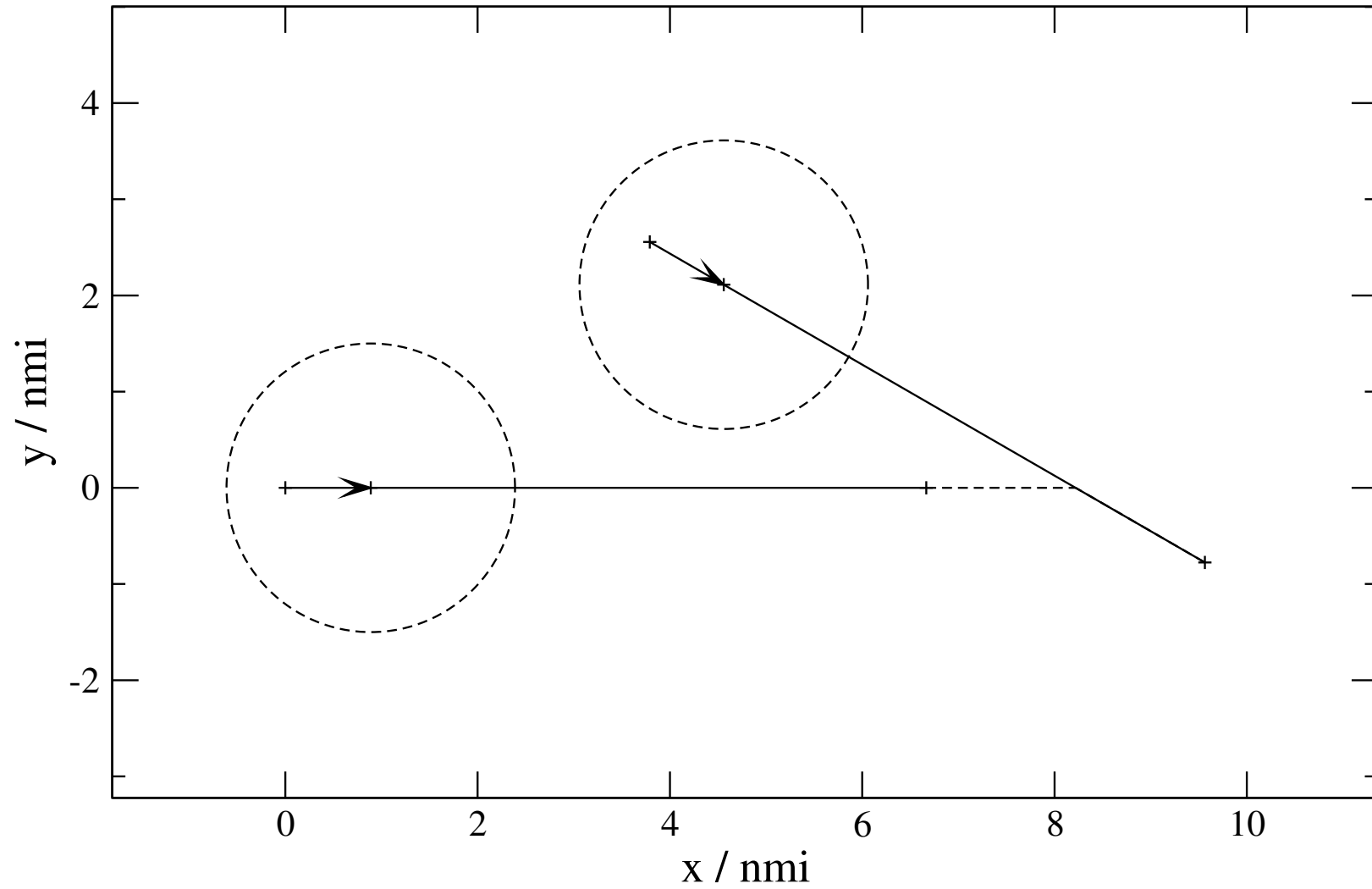
Constant-Velocity Encounter Planview

time: -106.0 sec, angle: 30 deg, min separation: 3.00 nmi



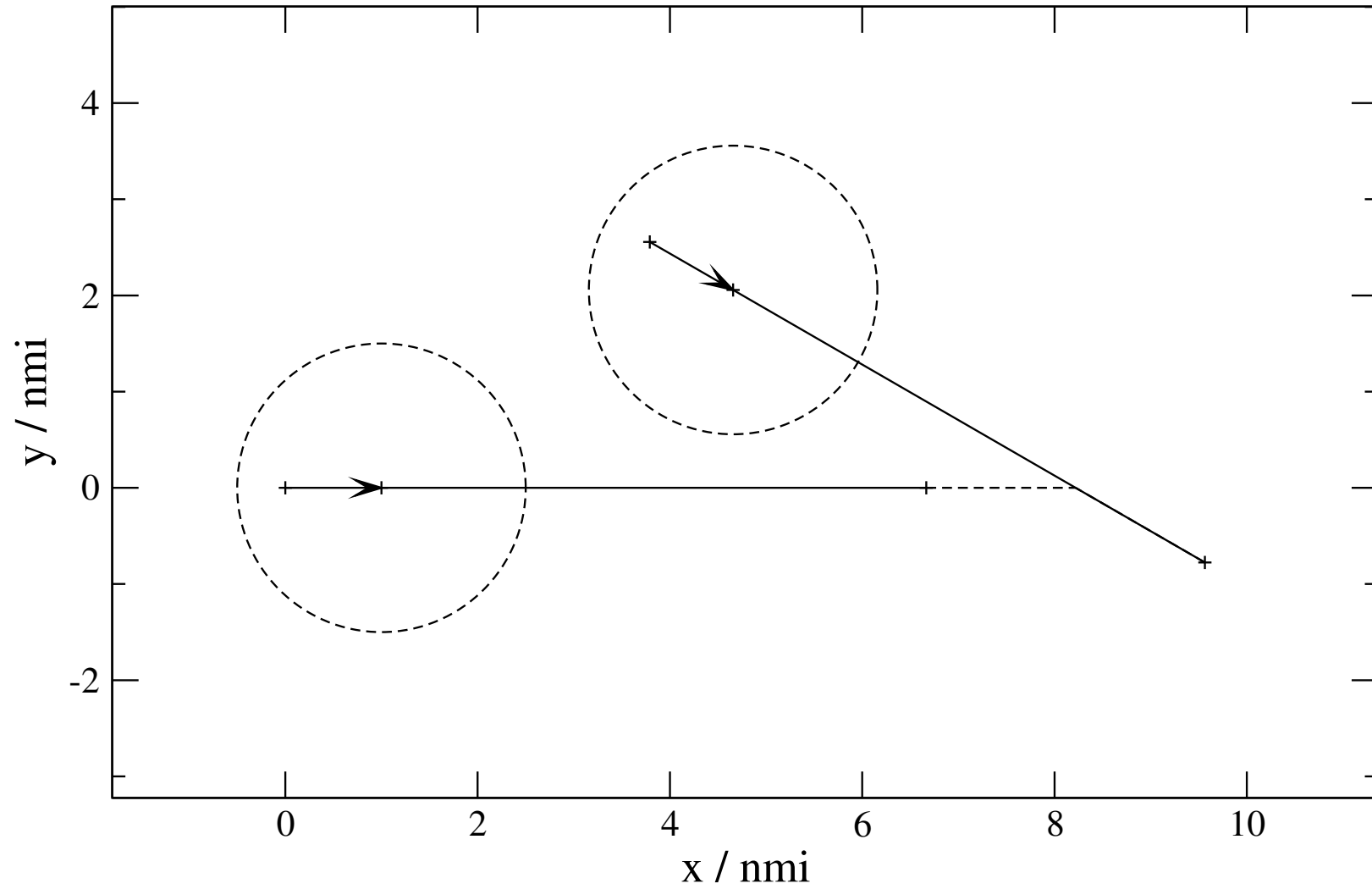
Constant-Velocity Encounter Planview

time: -104.0 sec, angle: 30 deg, min separation: 3.00 nmi



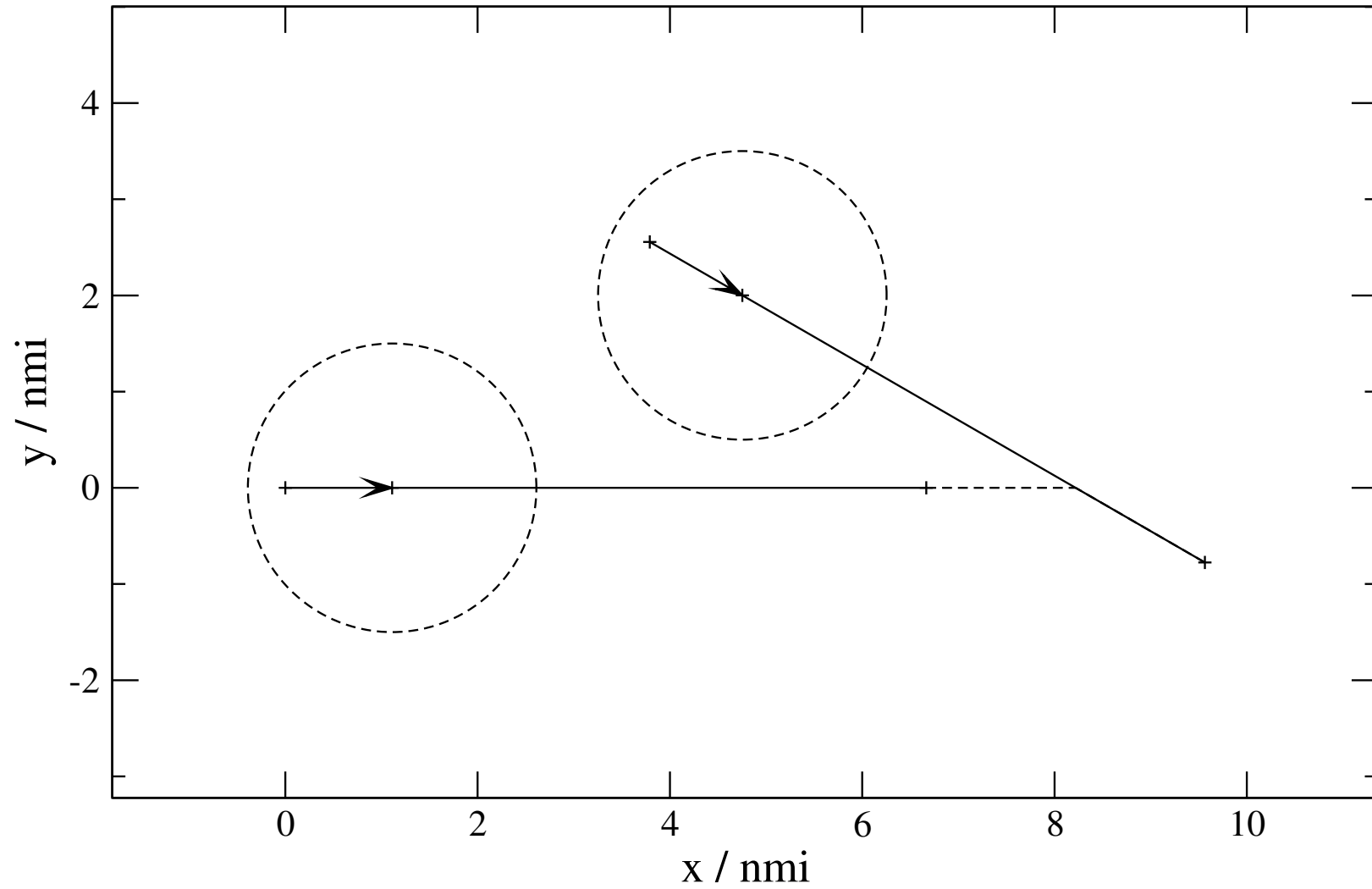
Constant-Velocity Encounter Planview

time: -102.0 sec, angle: 30 deg, min separation: 3.00 nmi



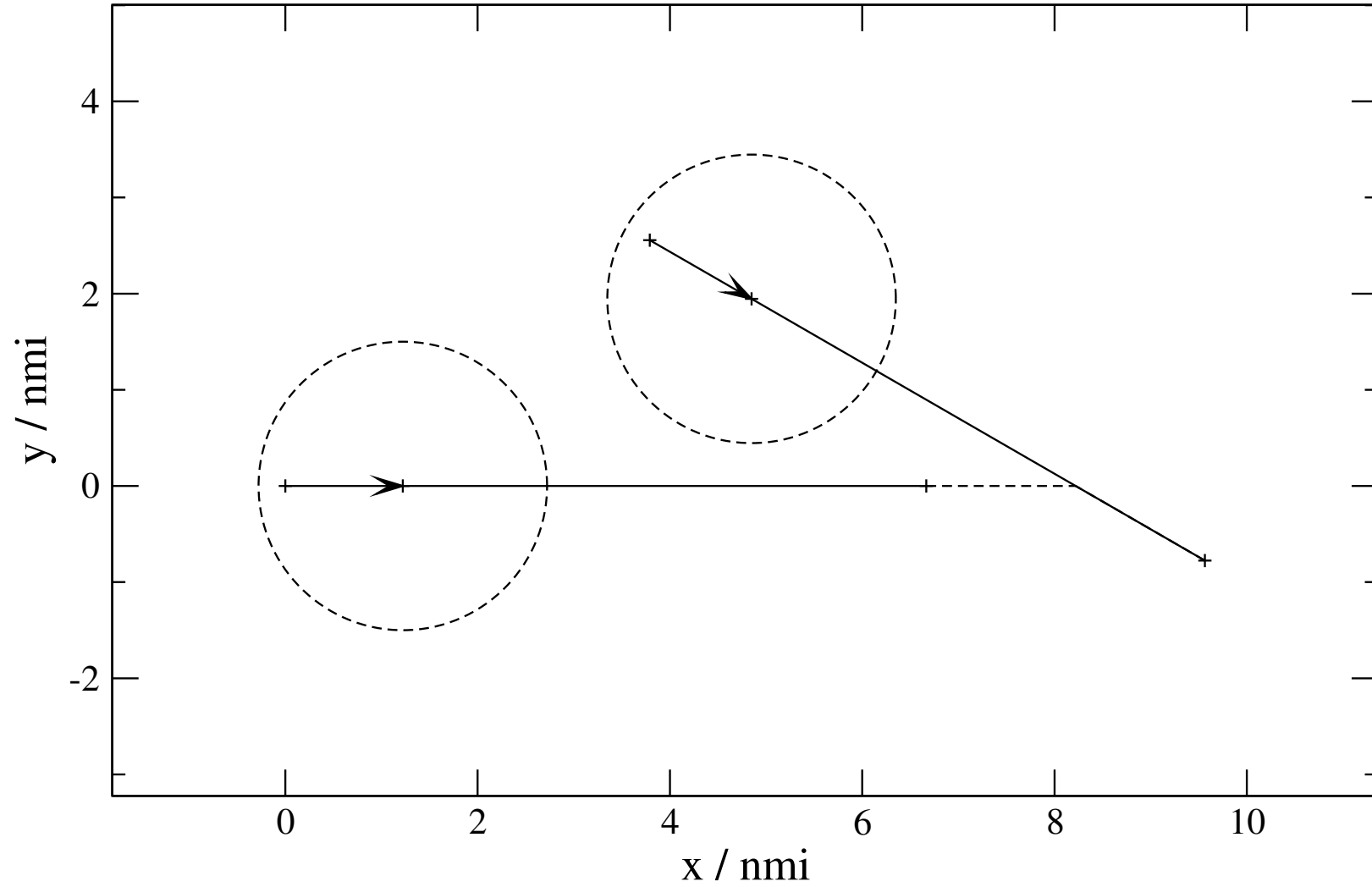
Constant-Velocity Encounter Planview

time: -100.0 sec, angle: 30 deg, min separation: 3.00 nmi



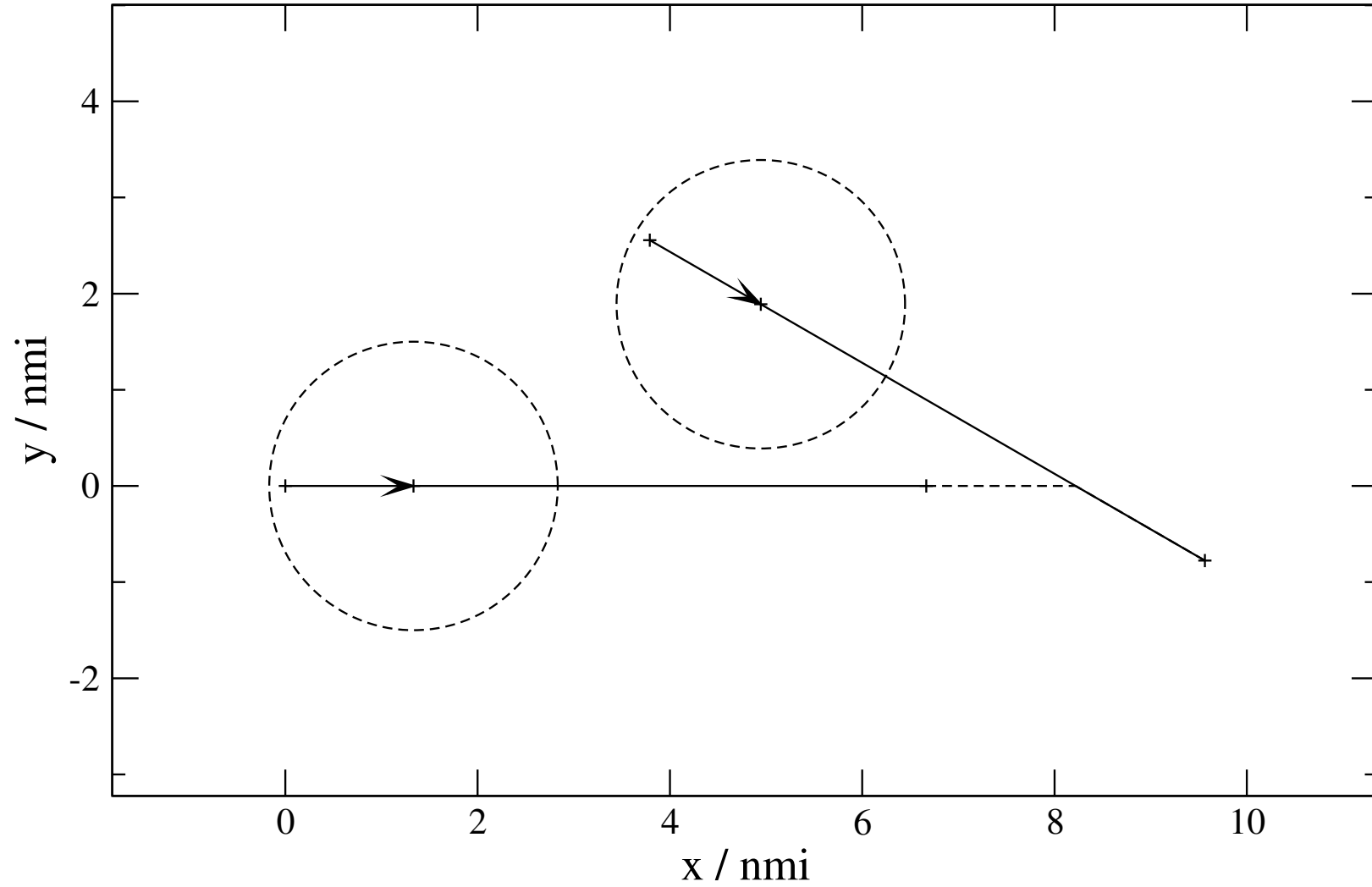
Constant-Velocity Encounter Planview

time: -98.0 sec, angle: 30 deg, min separation: 3.00 nmi



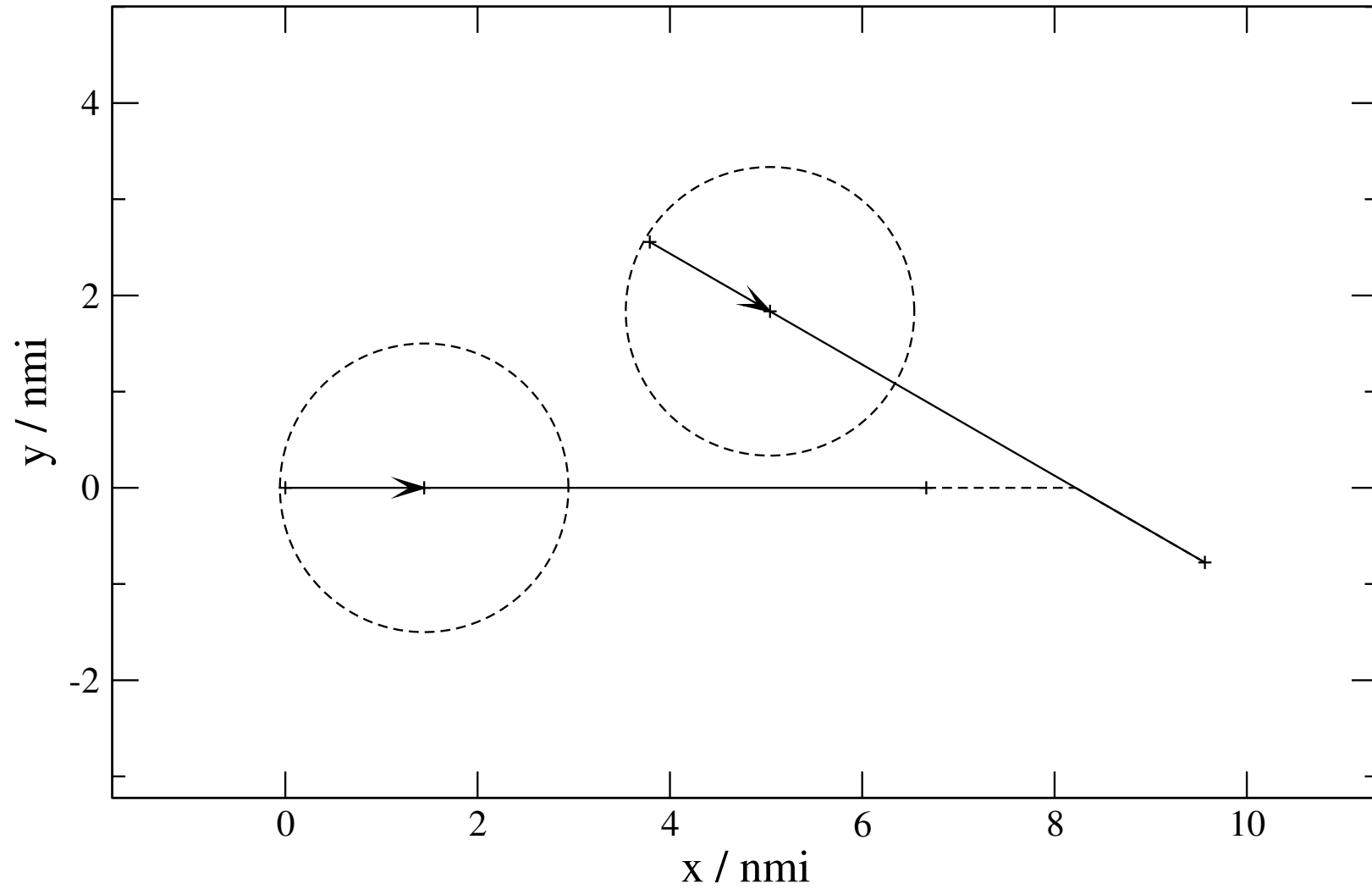
Constant-Velocity Encounter Planview

time: -96.0 sec, angle: 30 deg, min separation: 3.00 nmi



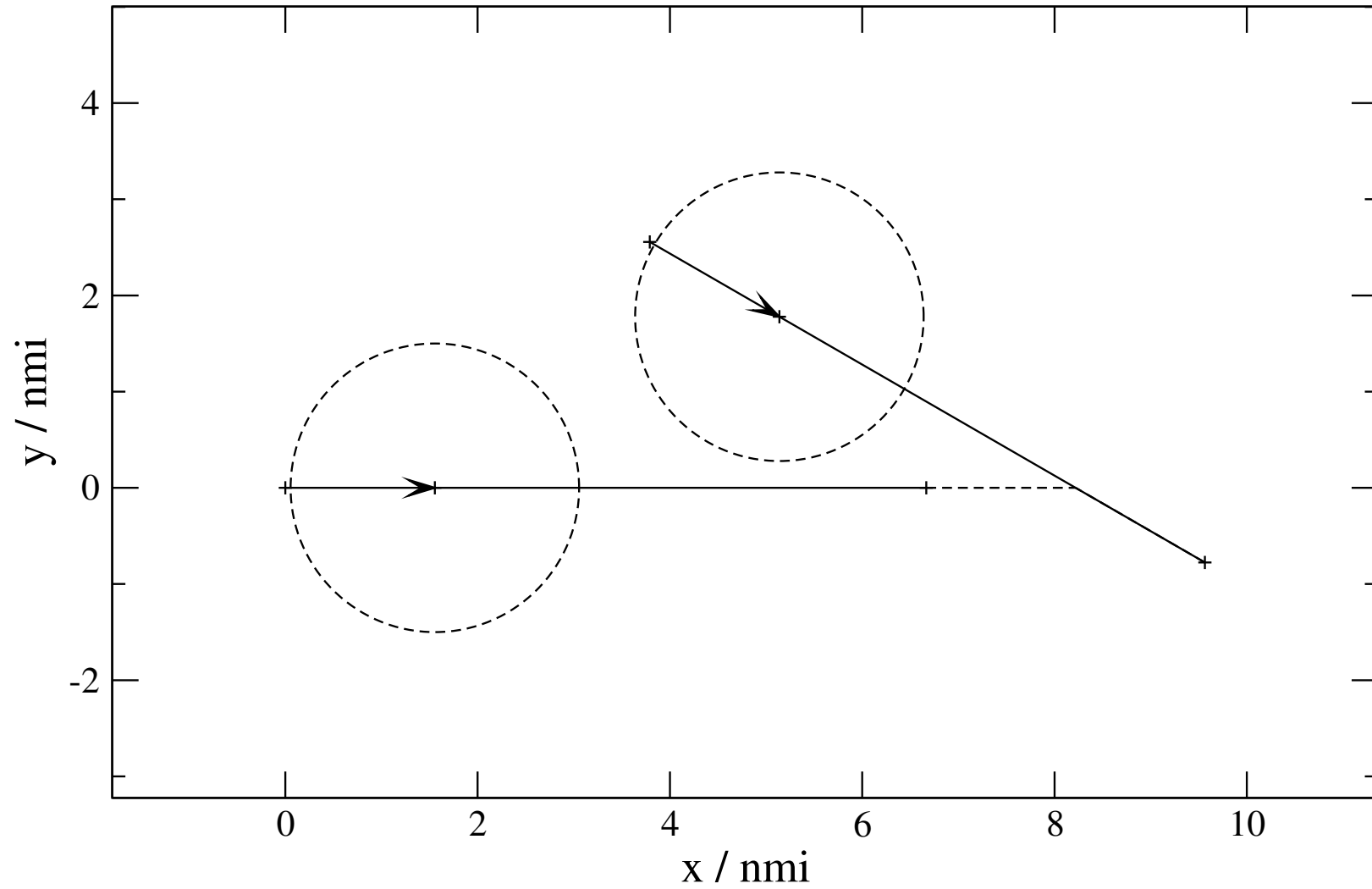
Constant-Velocity Encounter Planview

time: -94.0 sec, angle: 30 deg, min separation: 3.00 nmi



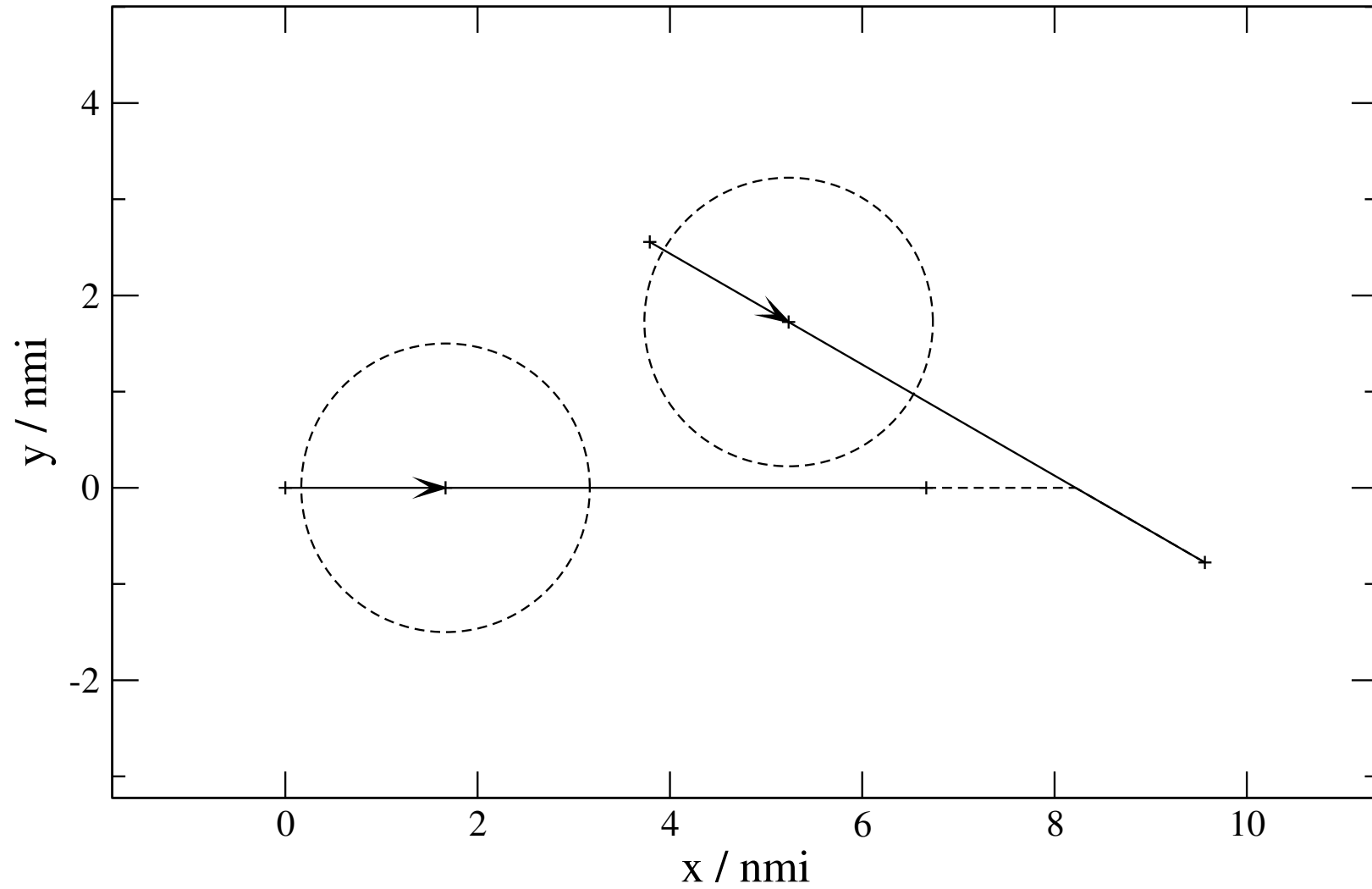
Constant-Velocity Encounter Planview

time: -92.0 sec, angle: 30 deg, min separation: 3.00 nmi



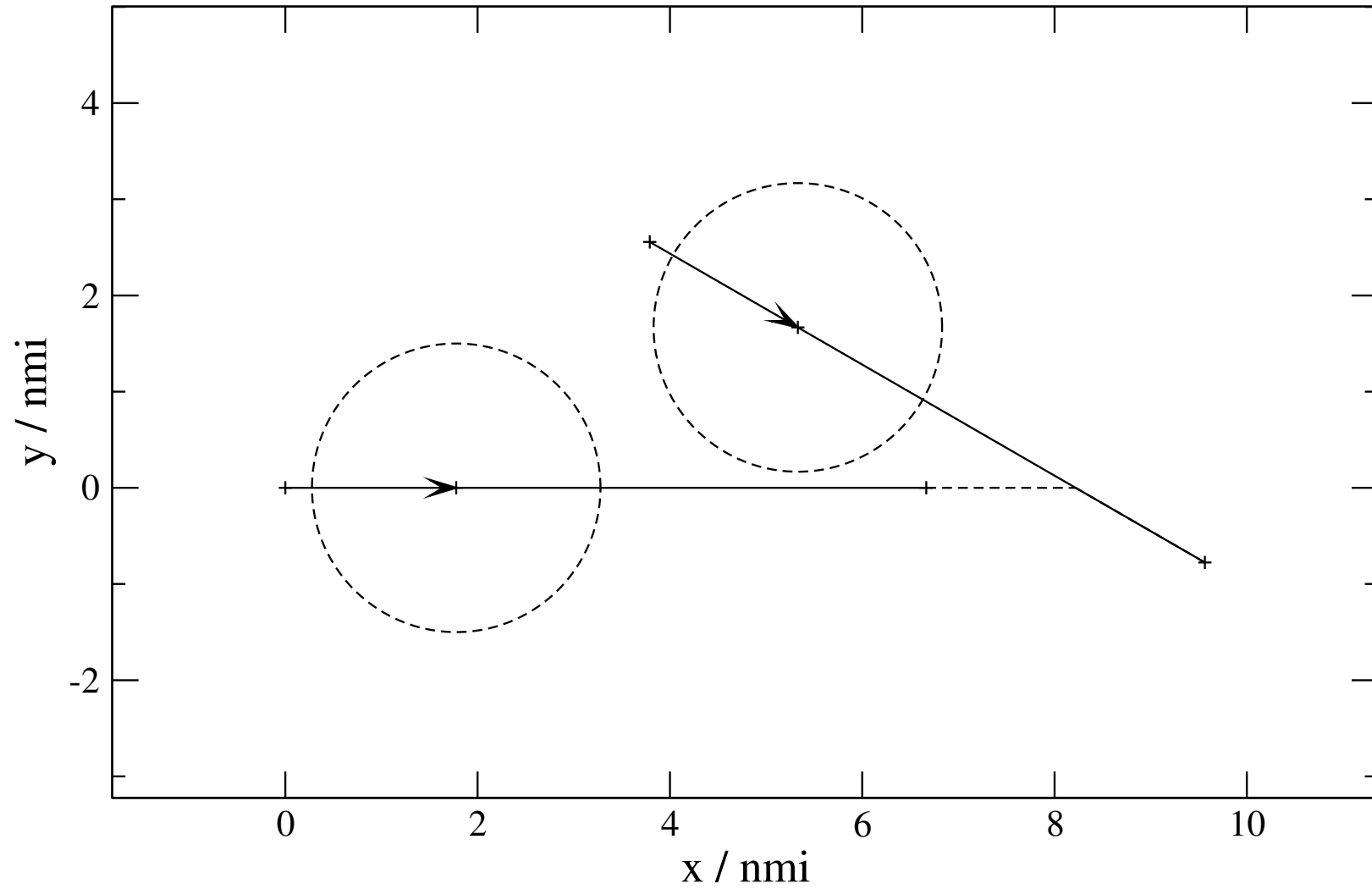
Constant-Velocity Encounter Planview

time: -90.0 sec, angle: 30 deg, min separation: 3.00 nmi



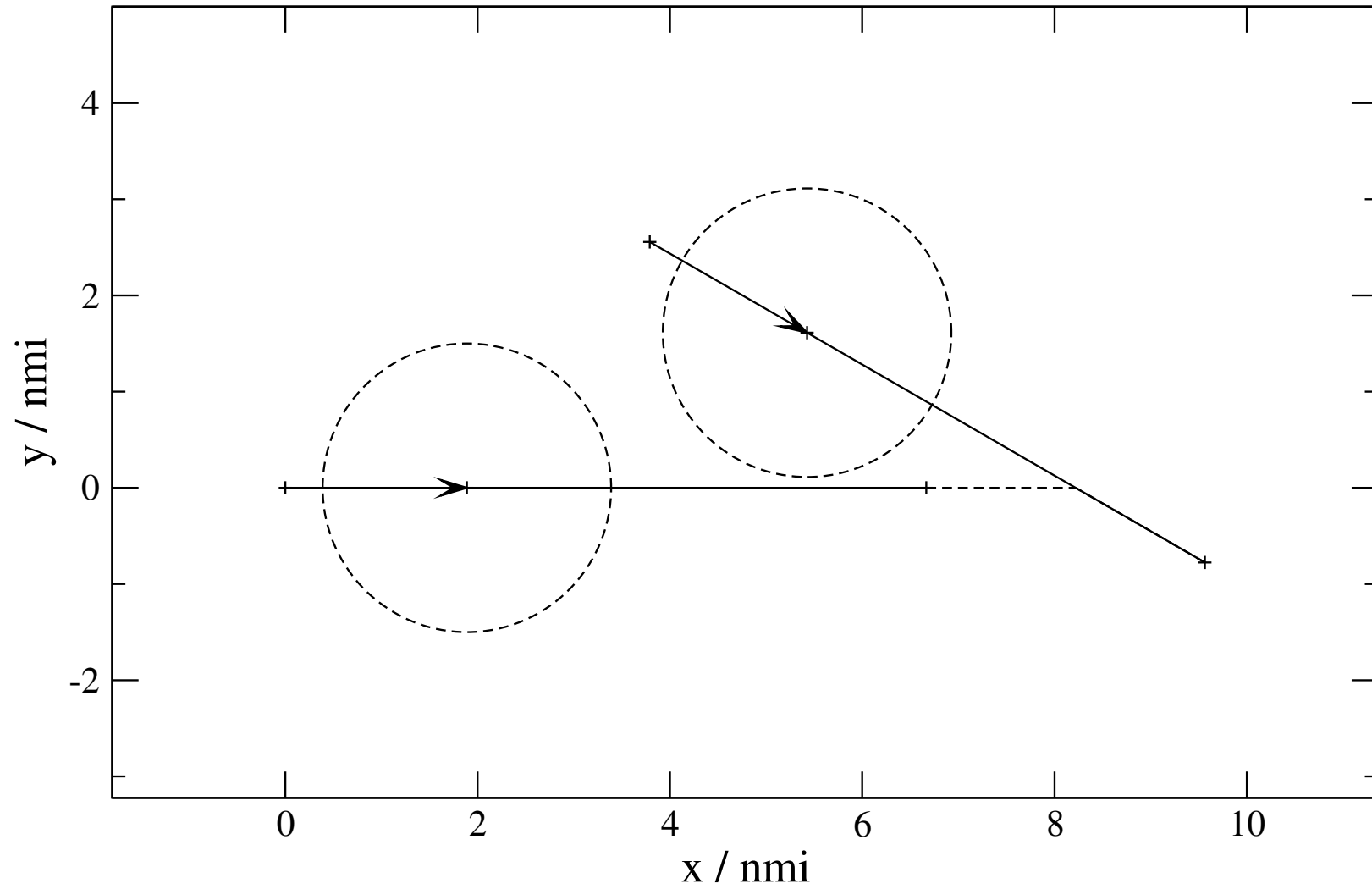
Constant-Velocity Encounter Planview

time: -88.0 sec, angle: 30 deg, min separation: 3.00 nmi



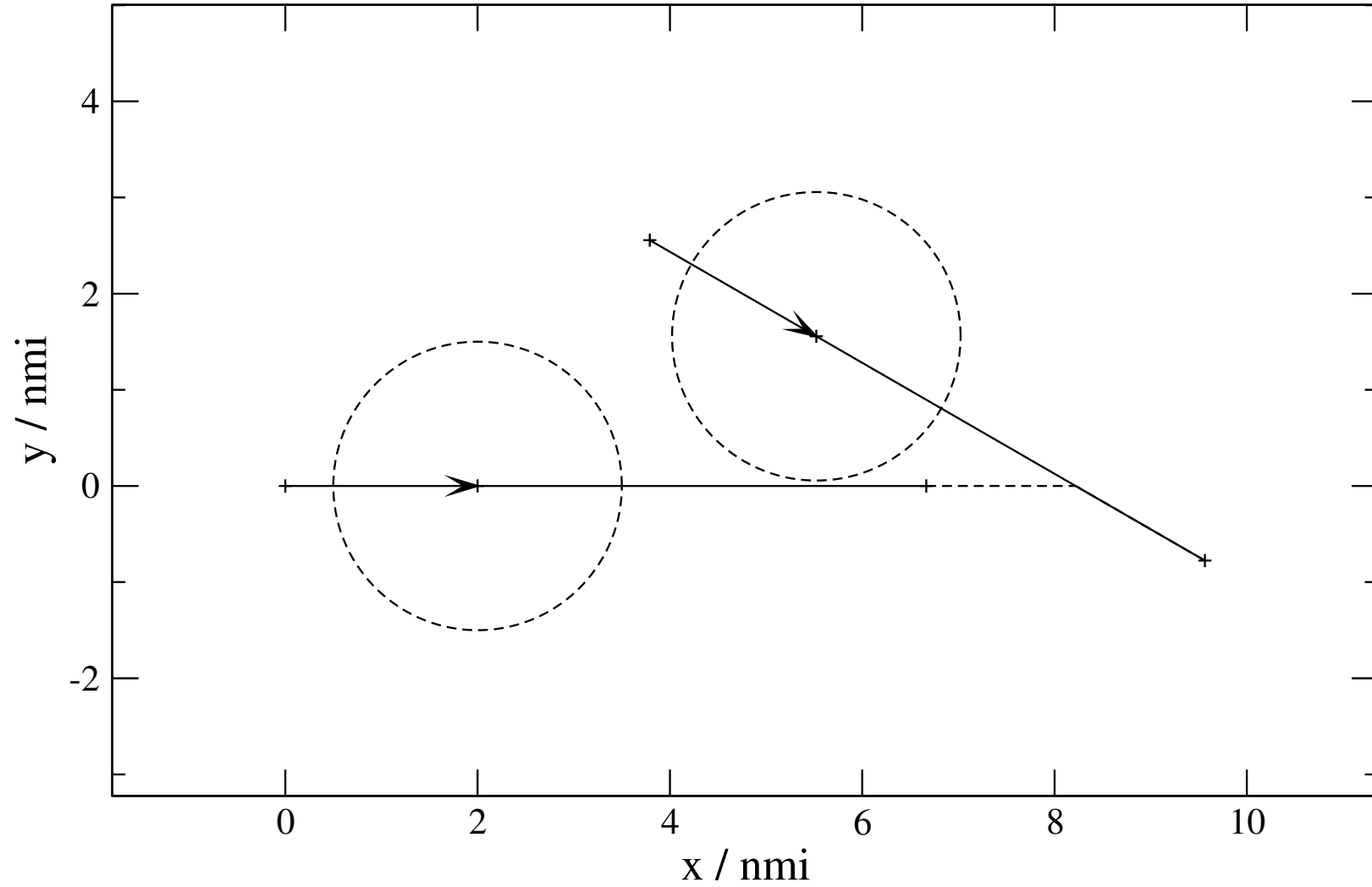
Constant-Velocity Encounter Planview

time: -86.0 sec, angle: 30 deg, min separation: 3.00 nmi



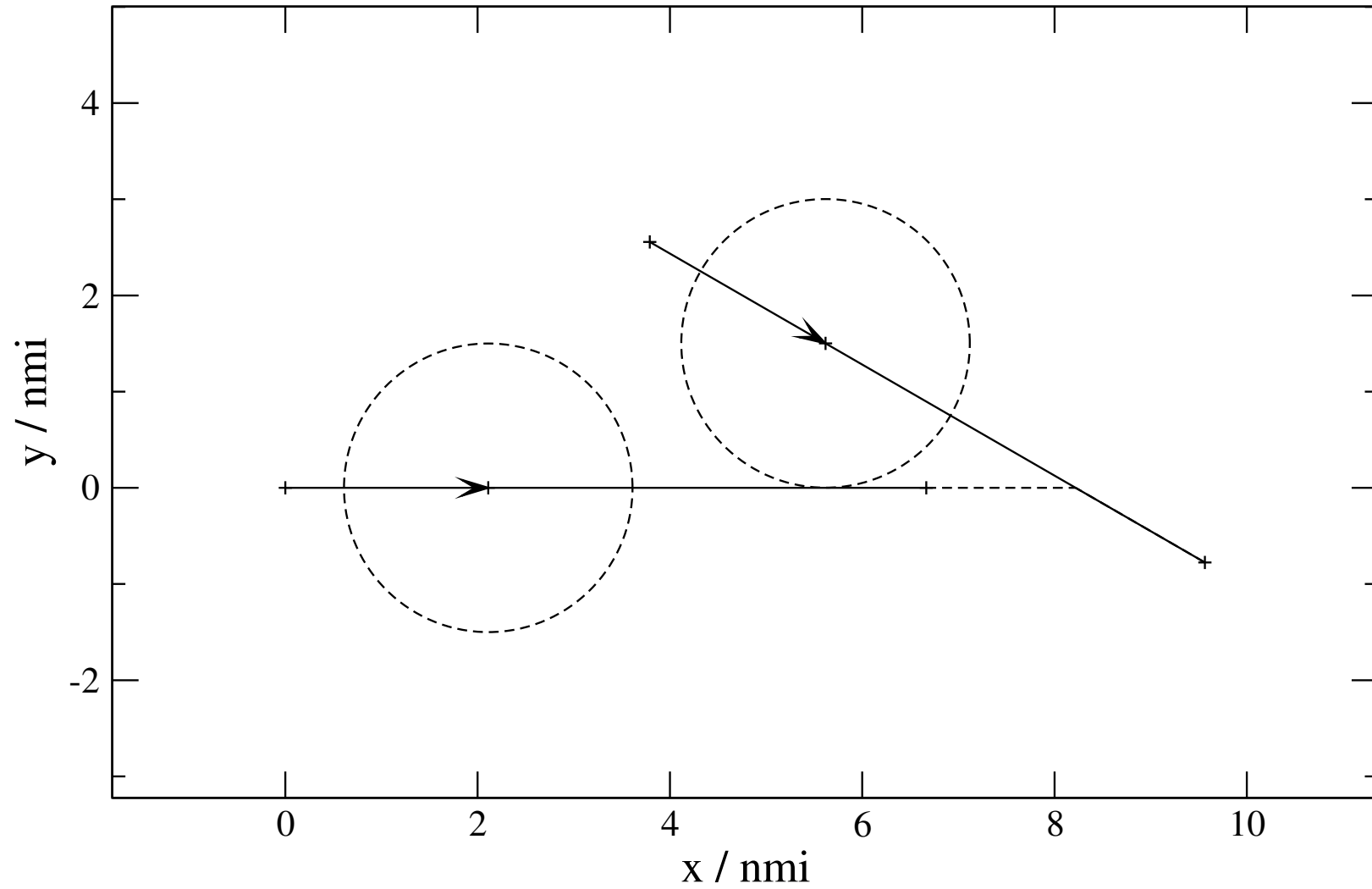
Constant-Velocity Encounter Planview

time: -84.0 sec, angle: 30 deg, min separation: 3.00 nmi



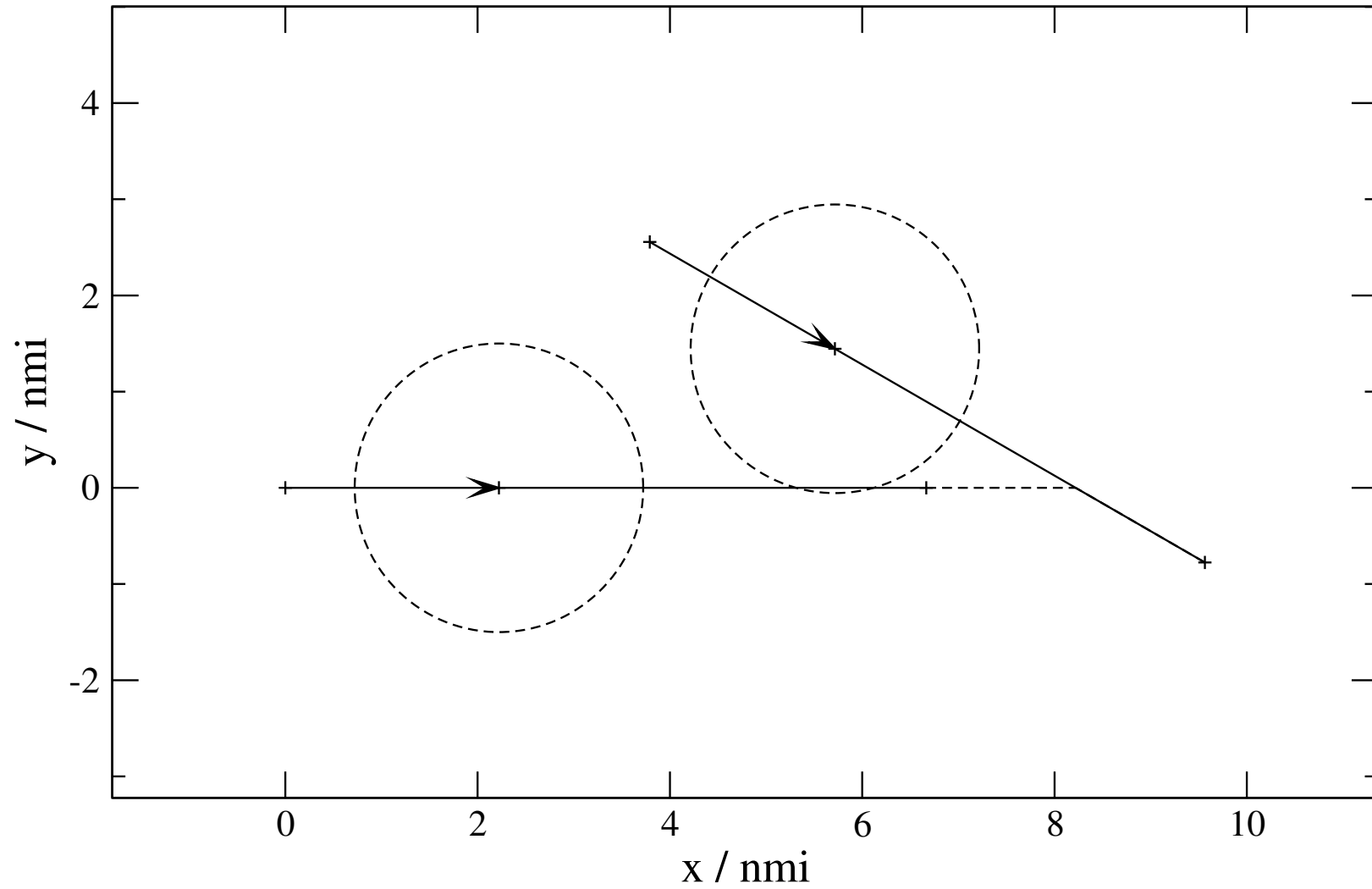
Constant-Velocity Encounter Planview

time: -82.0 sec, angle: 30 deg, min separation: 3.00 nmi



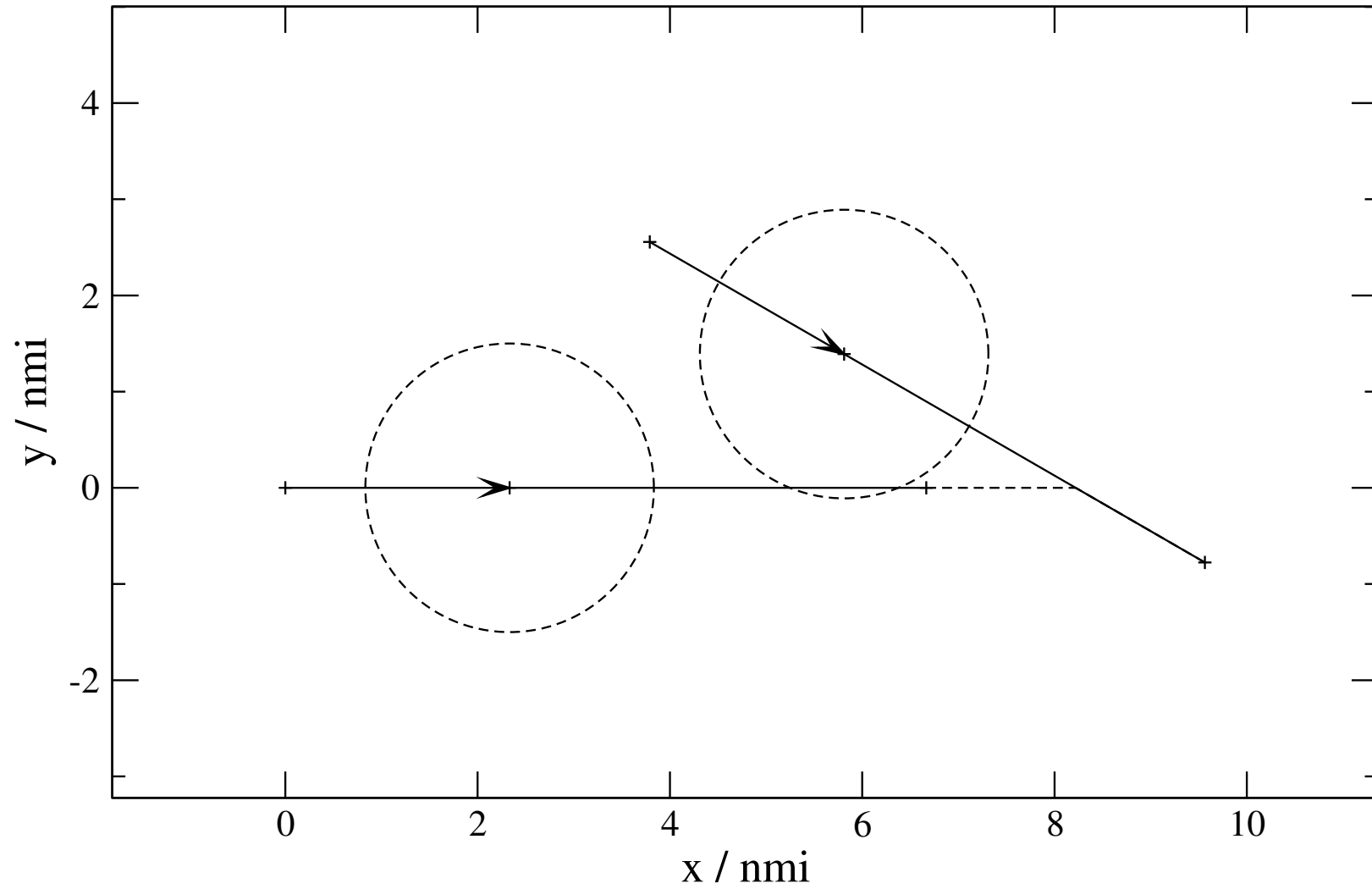
Constant-Velocity Encounter Planview

time: -80.0 sec, angle: 30 deg, min separation: 3.00 nmi



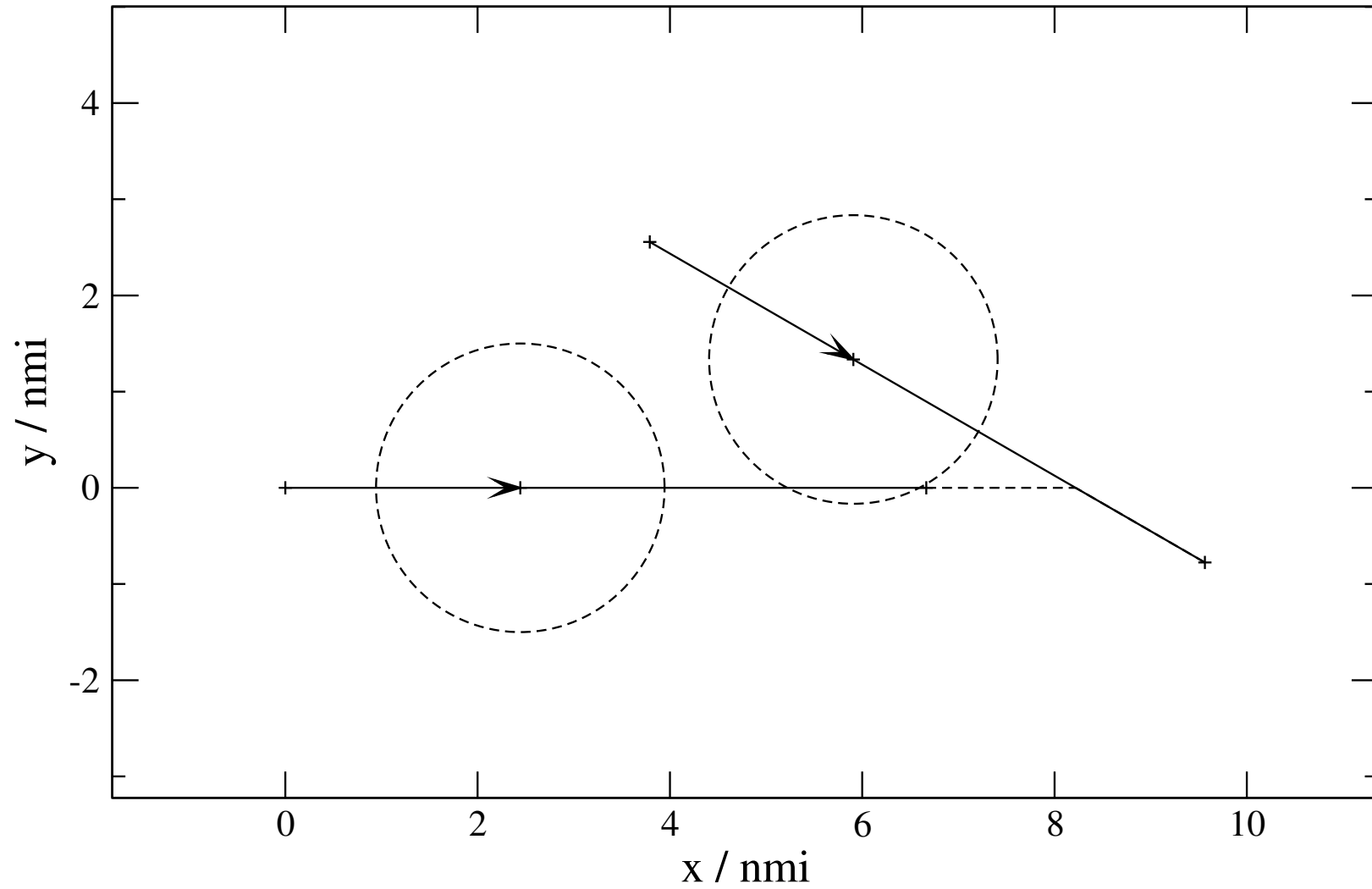
Constant-Velocity Encounter Planview

time: -78.0 sec, angle: 30 deg, min separation: 3.00 nmi



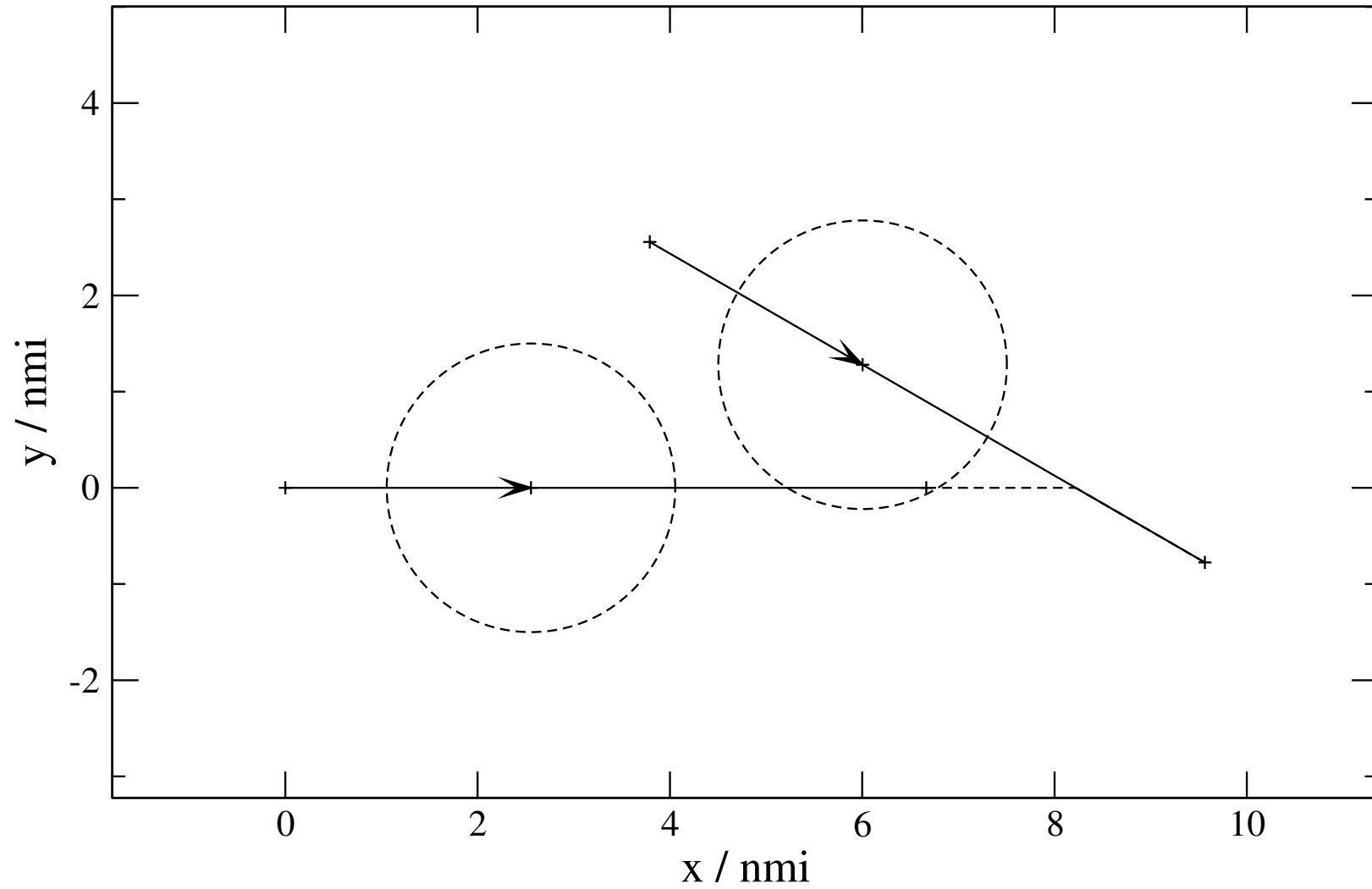
Constant-Velocity Encounter Planview

time: -76.0 sec, angle: 30 deg, min separation: 3.00 nmi



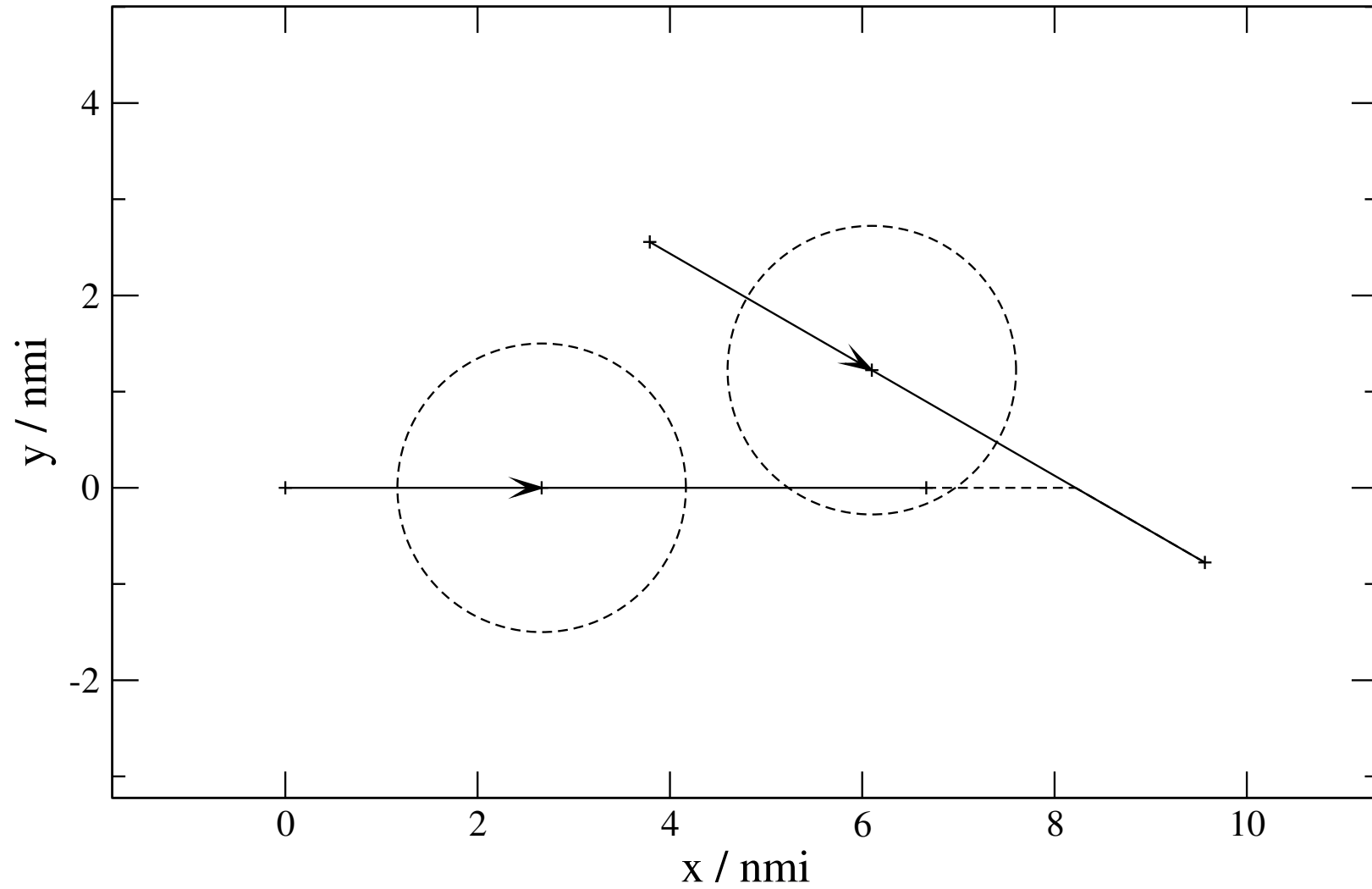
Constant-Velocity Encounter Planview

time: -74.0 sec, angle: 30 deg, min separation: 3.00 nmi



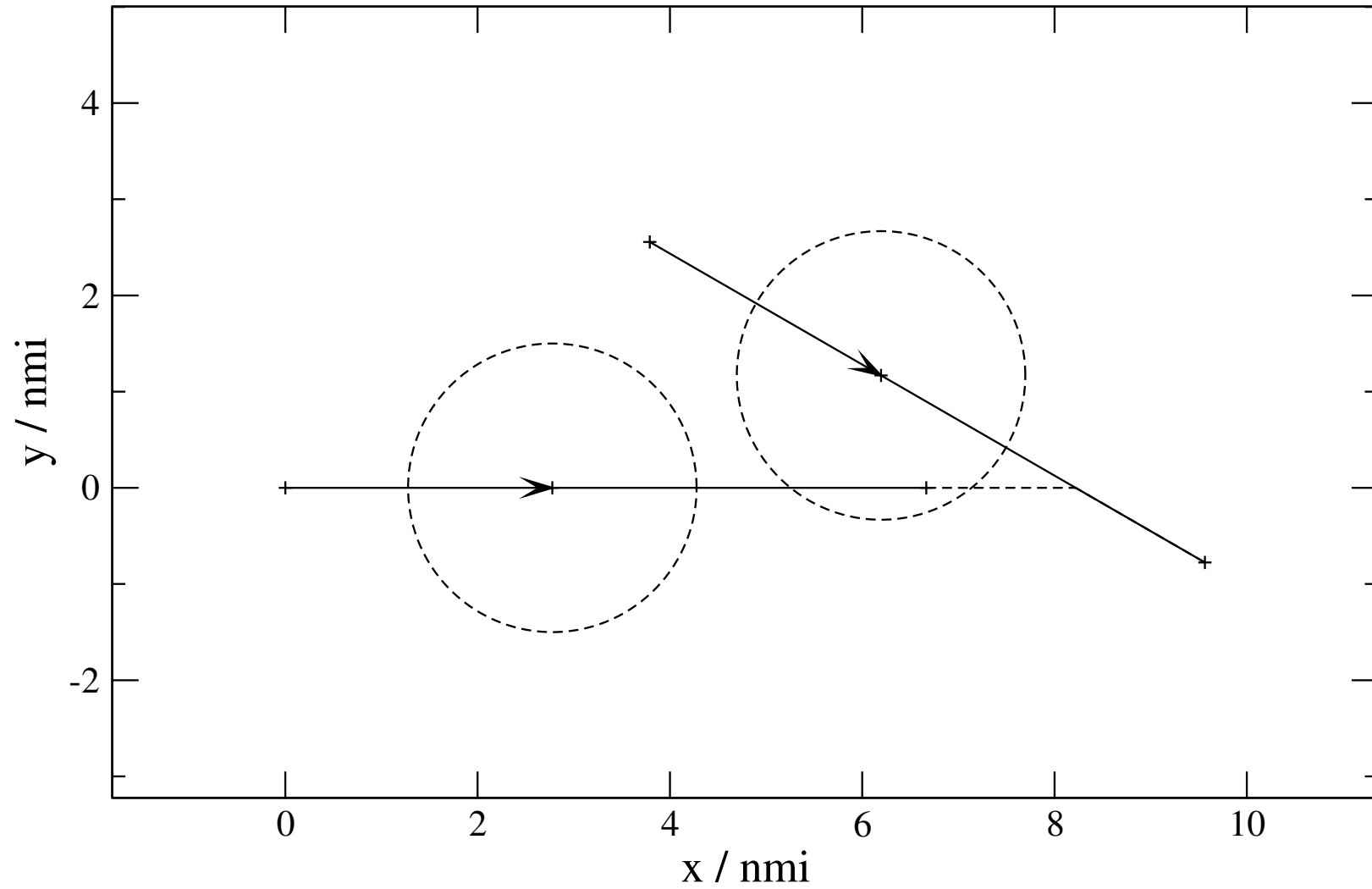
Constant-Velocity Encounter Planview

time: -72.0 sec, angle: 30 deg, min separation: 3.00 nmi



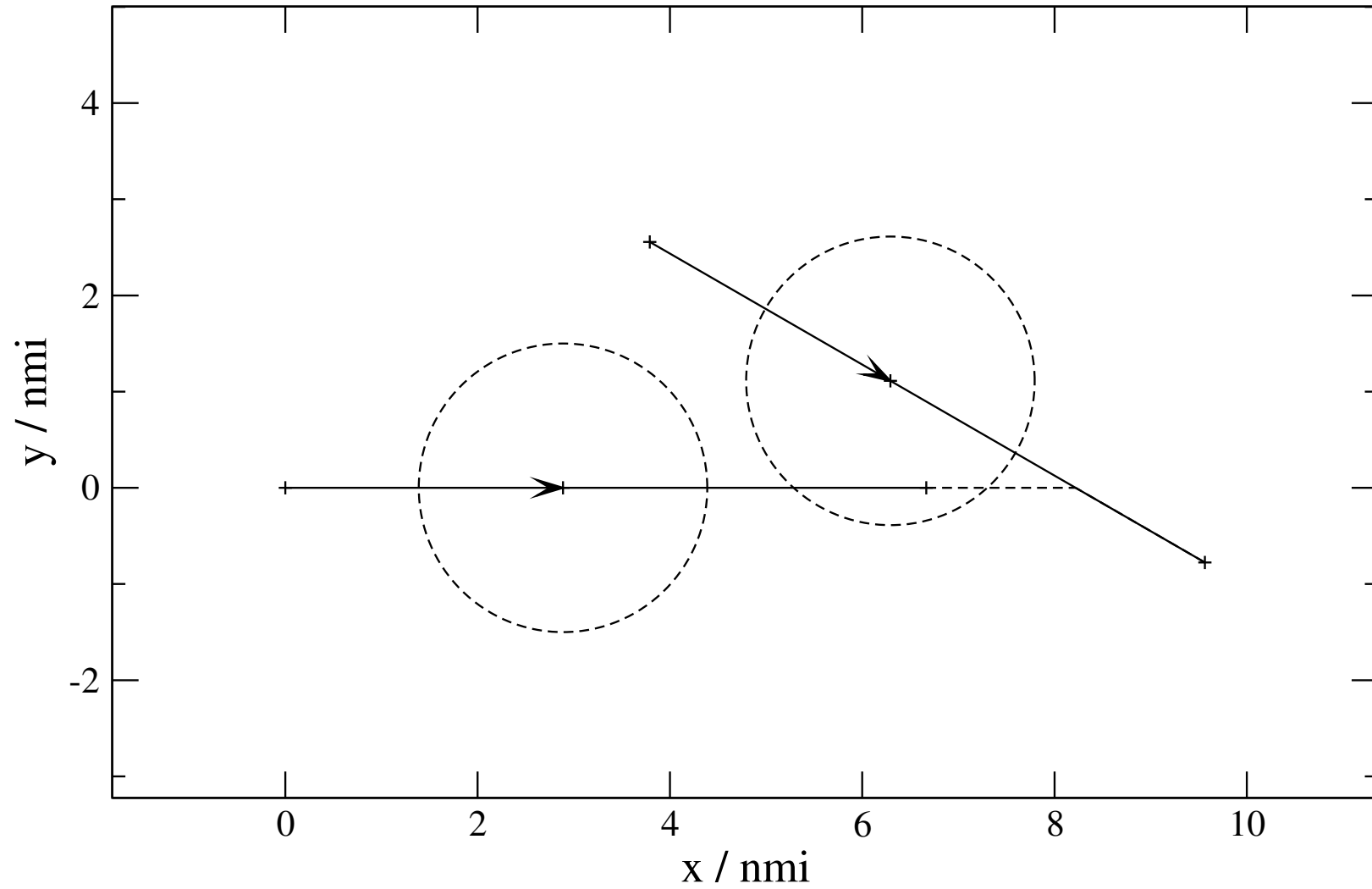
Constant-Velocity Encounter Planview

time: -70.0 sec, angle: 30 deg, min separation: 3.00 nmi



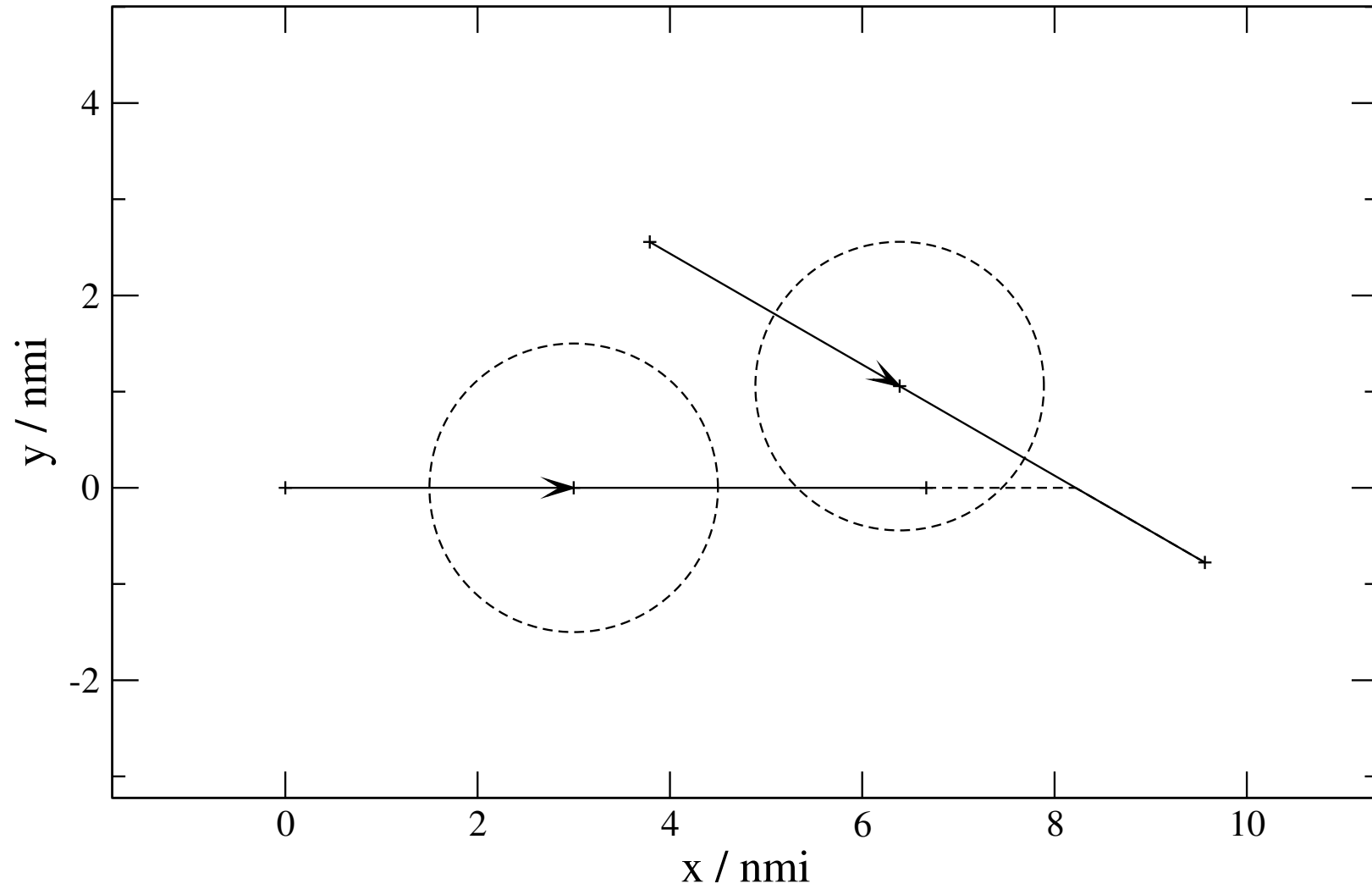
Constant-Velocity Encounter Planview

time: -68.0 sec, angle: 30 deg, min separation: 3.00 nmi



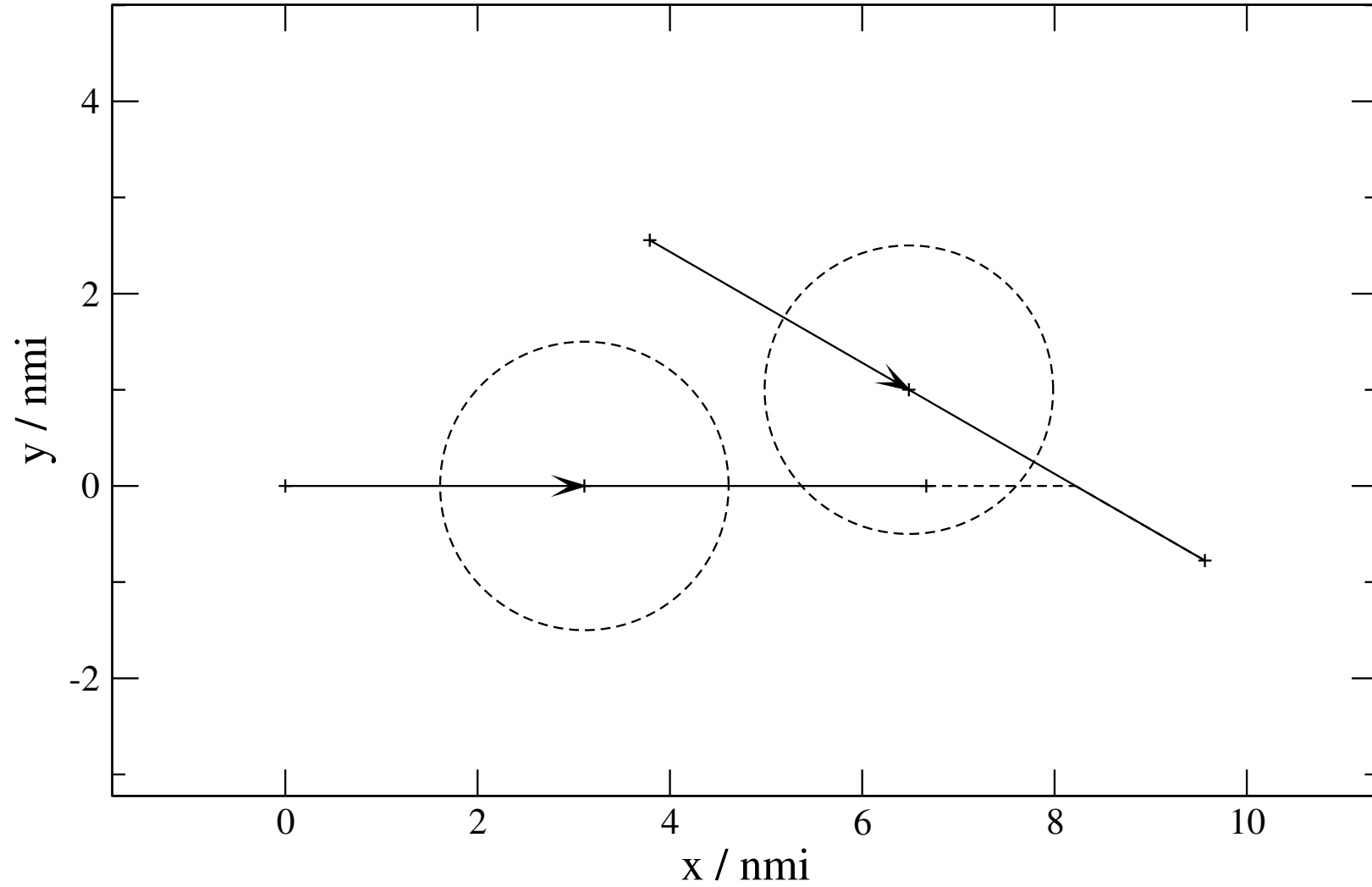
Constant-Velocity Encounter Planview

time: -66.0 sec, angle: 30 deg, min separation: 3.00 nmi



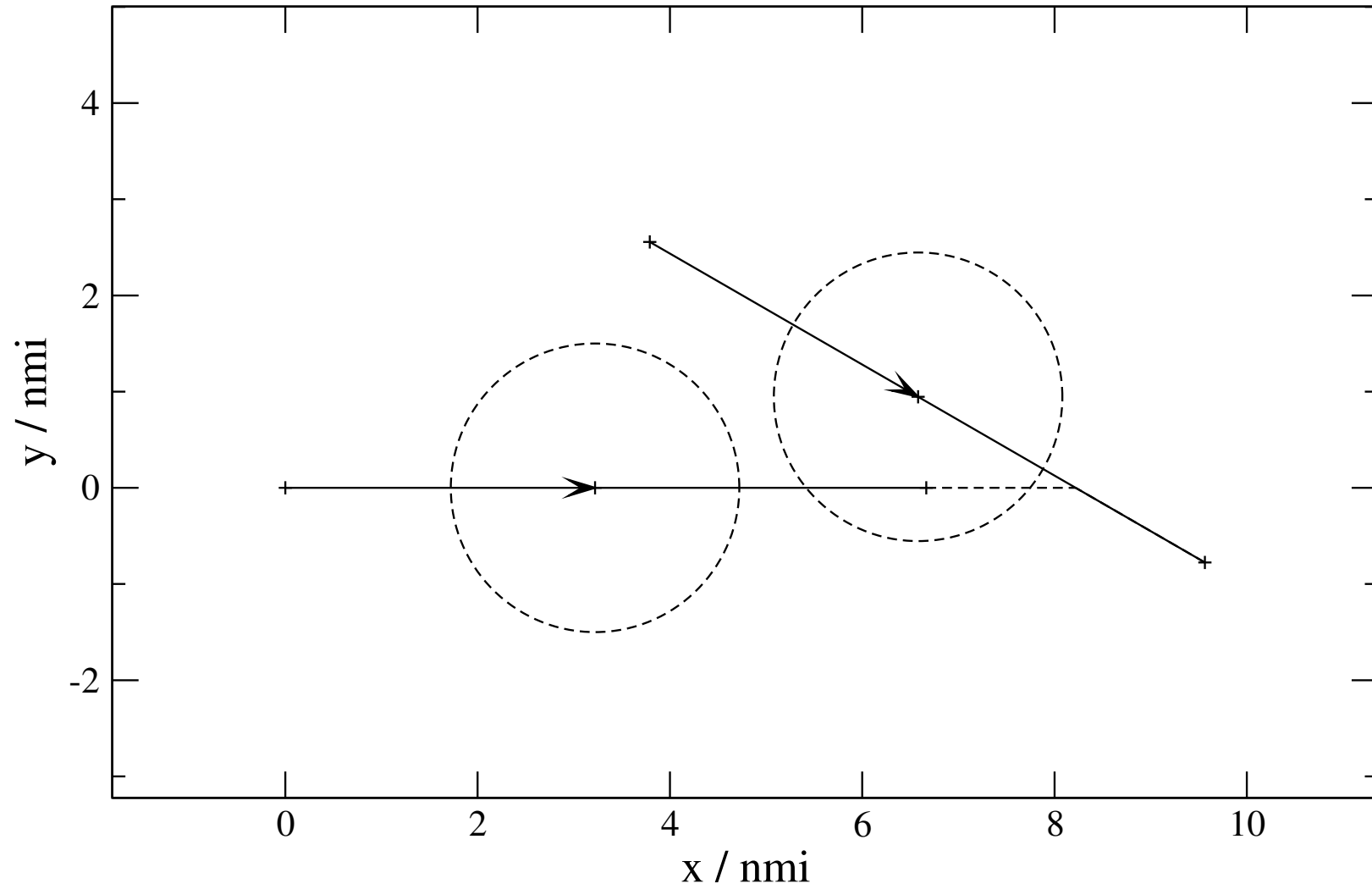
Constant-Velocity Encounter Planview

time: -64.0 sec, angle: 30 deg, min separation: 3.00 nmi



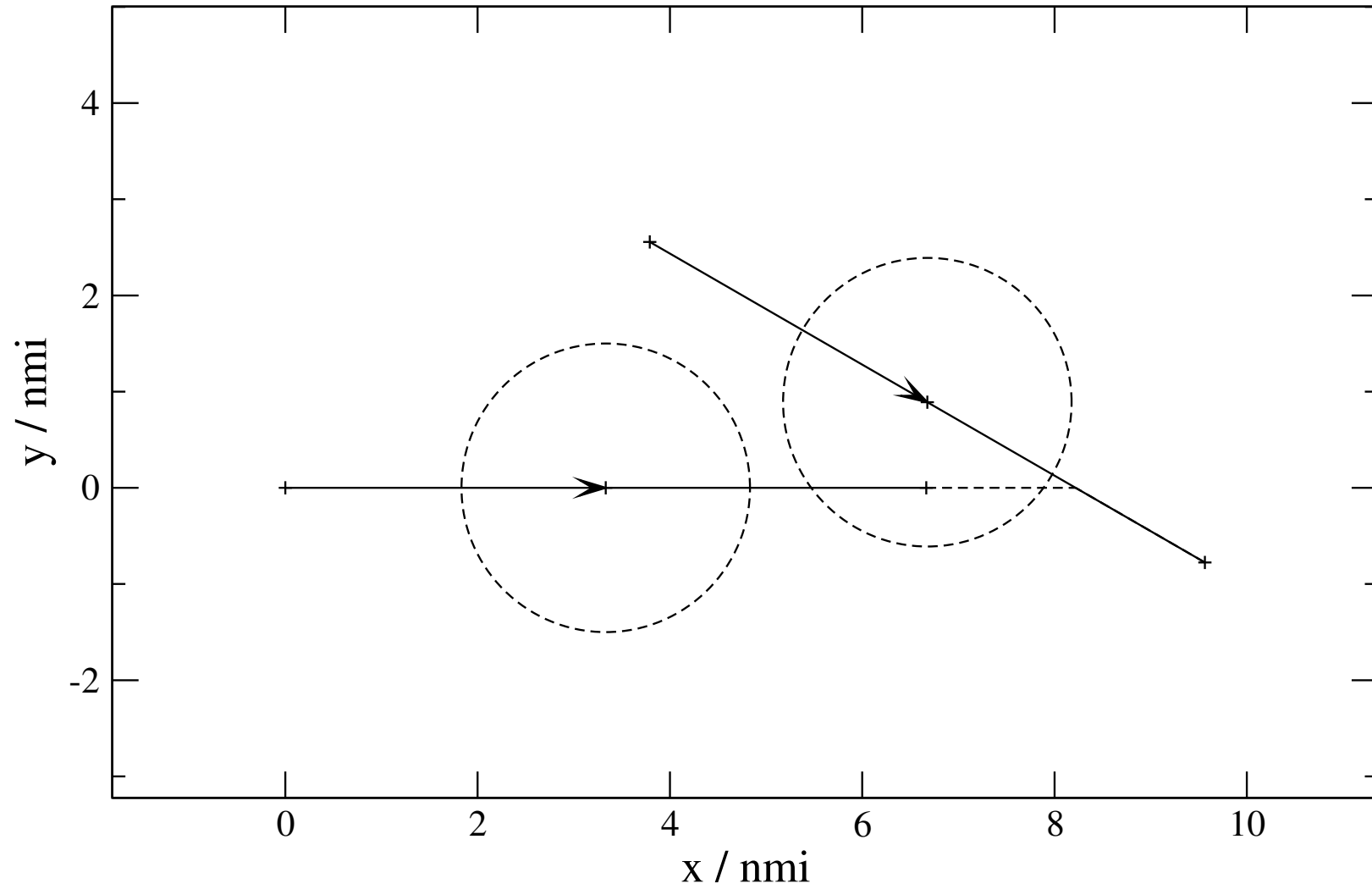
Constant-Velocity Encounter Planview

time: -62.0 sec, angle: 30 deg, min separation: 3.00 nmi



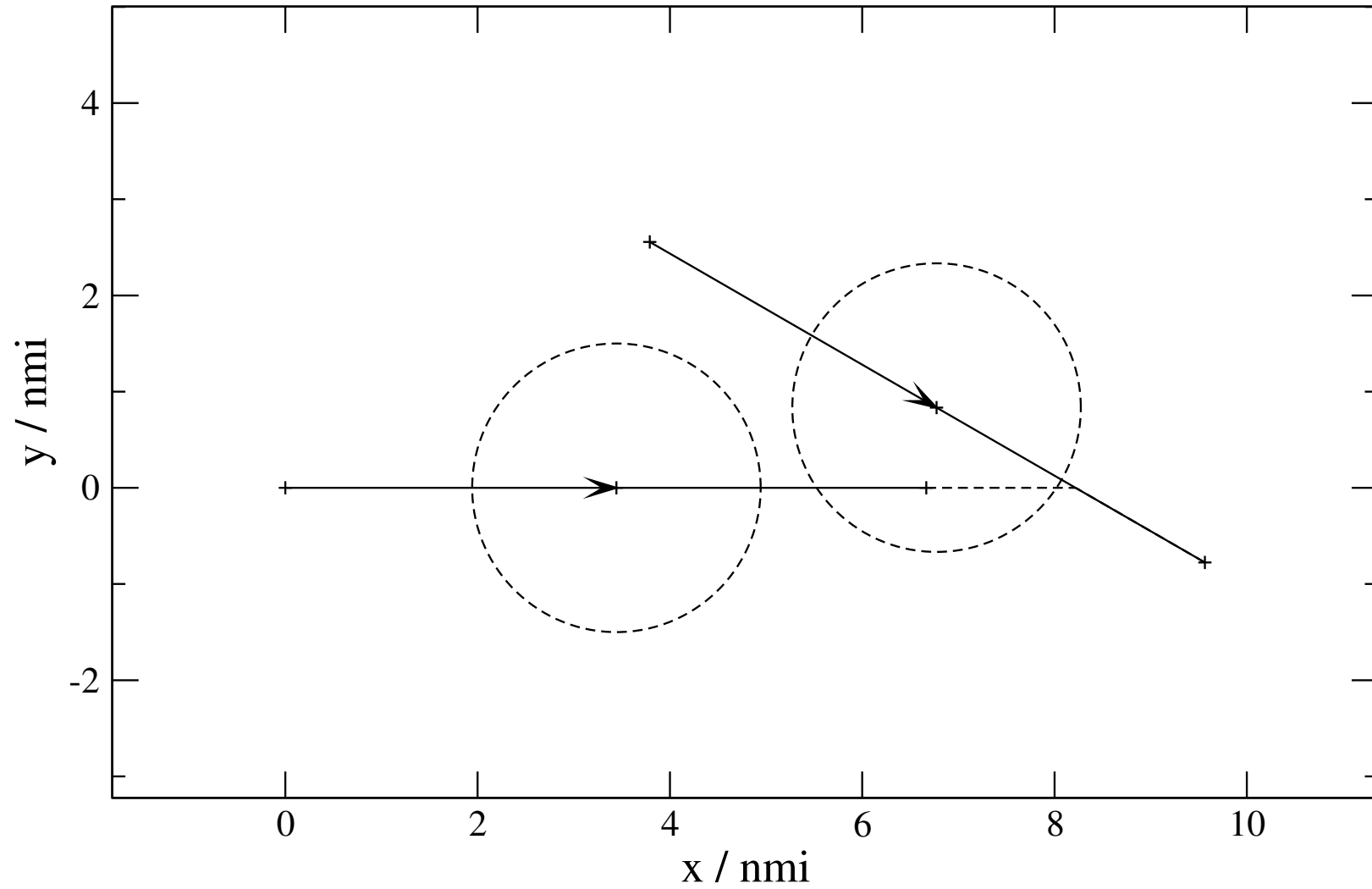
Constant-Velocity Encounter Planview

time: -60.0 sec, angle: 30 deg, min separation: 3.00 nmi



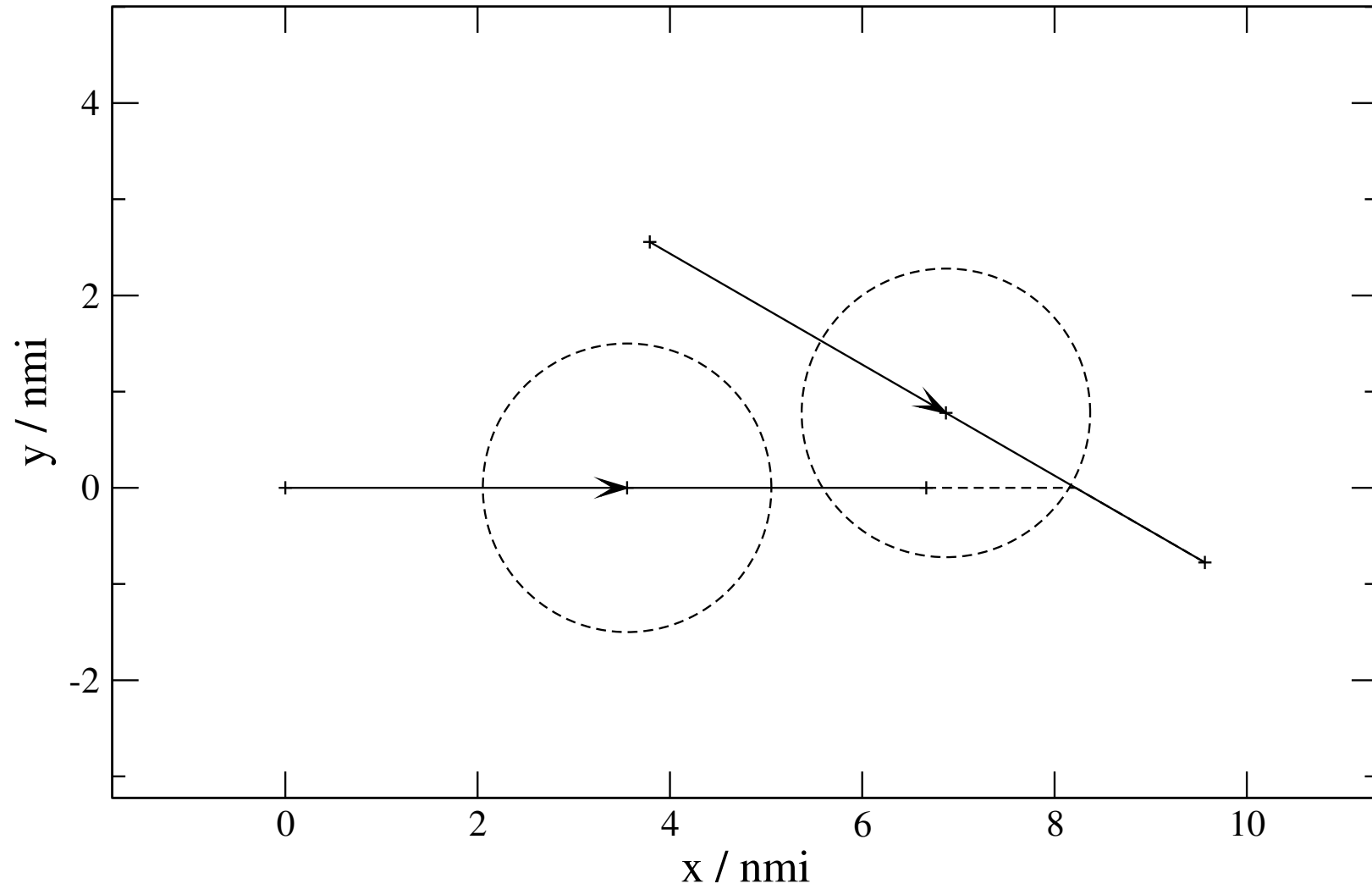
Constant-Velocity Encounter Planview

time: -58.0 sec, angle: 30 deg, min separation: 3.00 nmi



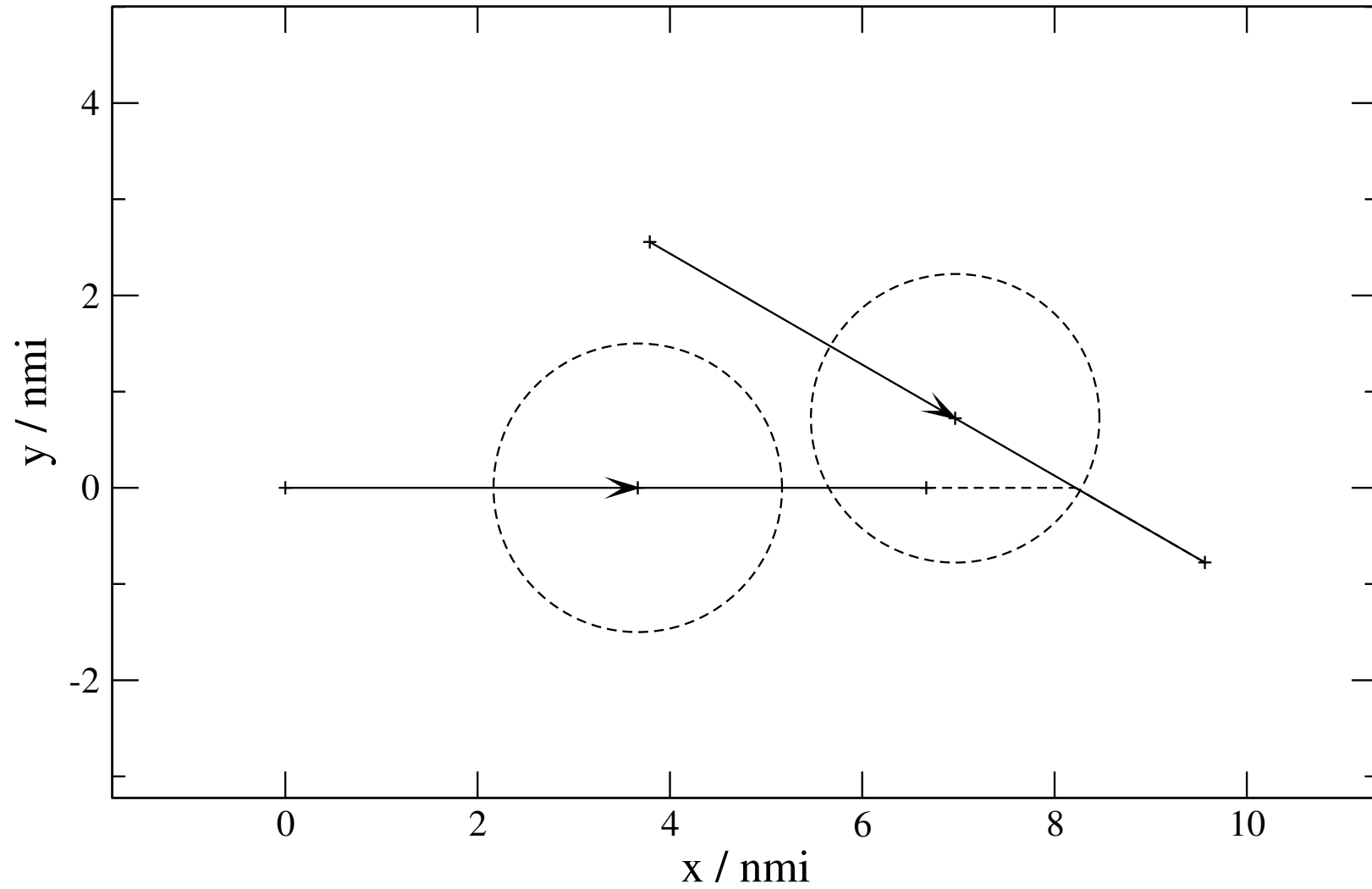
Constant-Velocity Encounter Planview

time: -56.0 sec, angle: 30 deg, min separation: 3.00 nmi



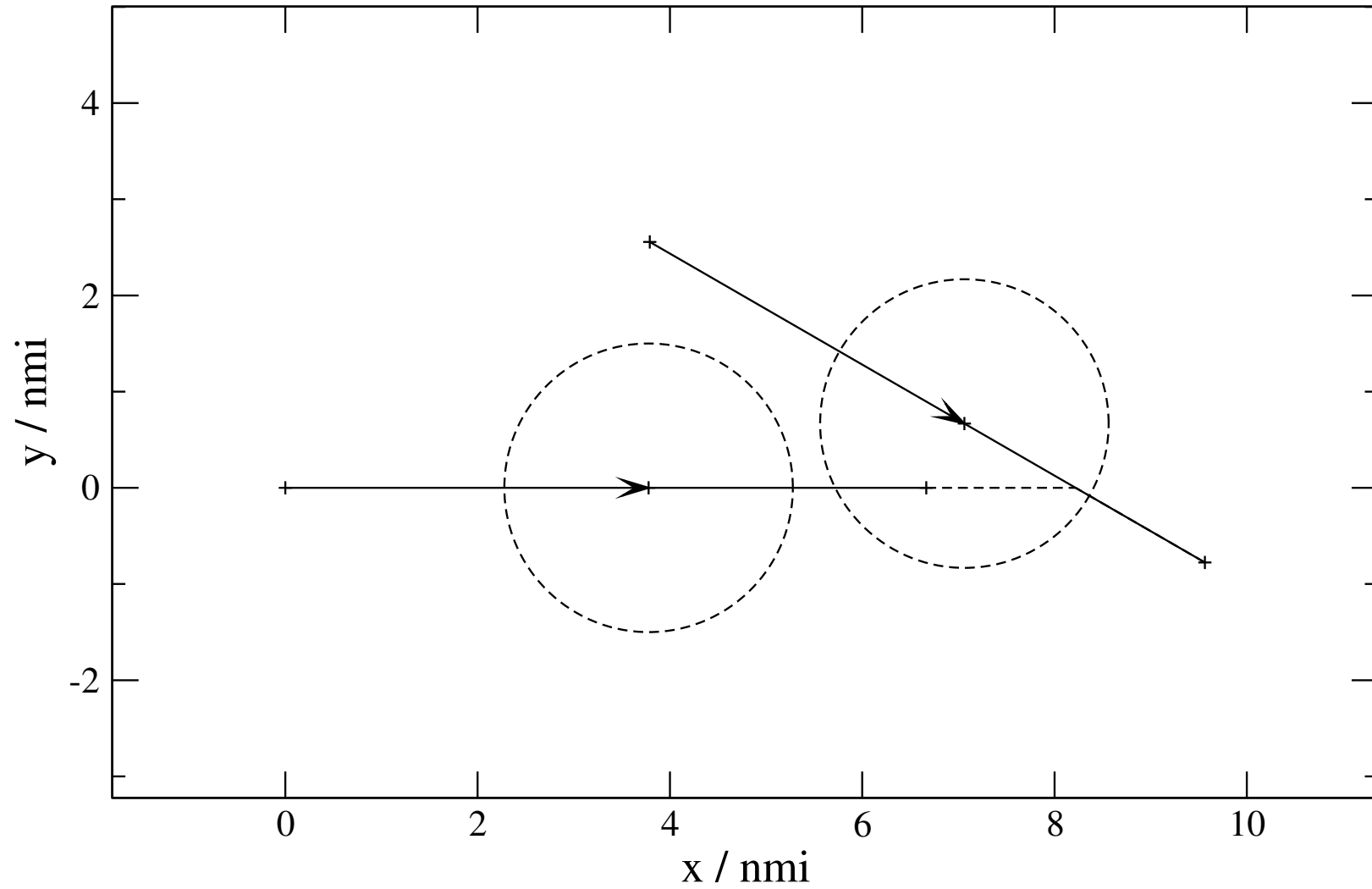
Constant-Velocity Encounter Planview

time: -54.0 sec, angle: 30 deg, min separation: 3.00 nmi



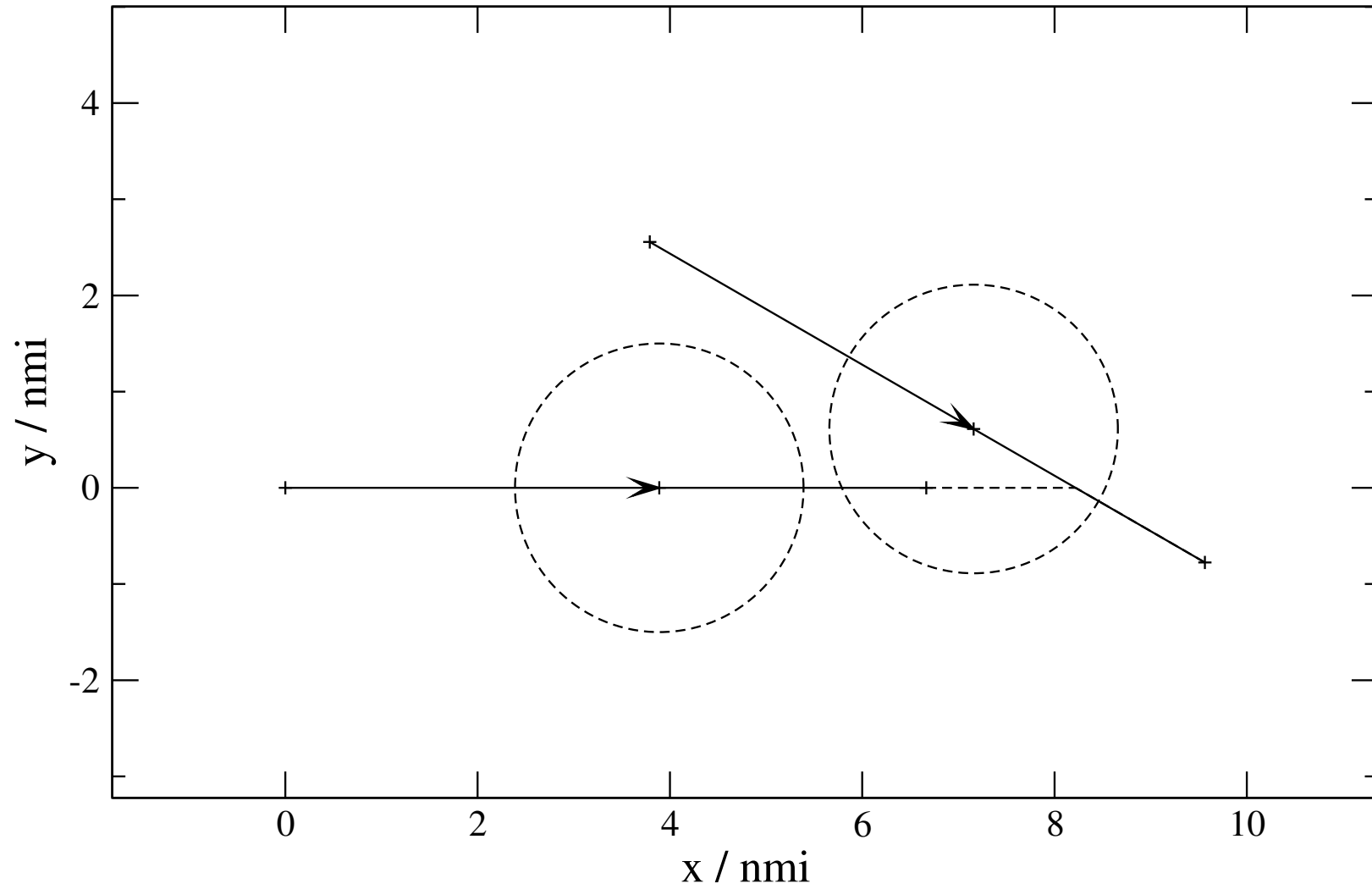
Constant-Velocity Encounter Planview

time: -52.0 sec, angle: 30 deg, min separation: 3.00 nmi



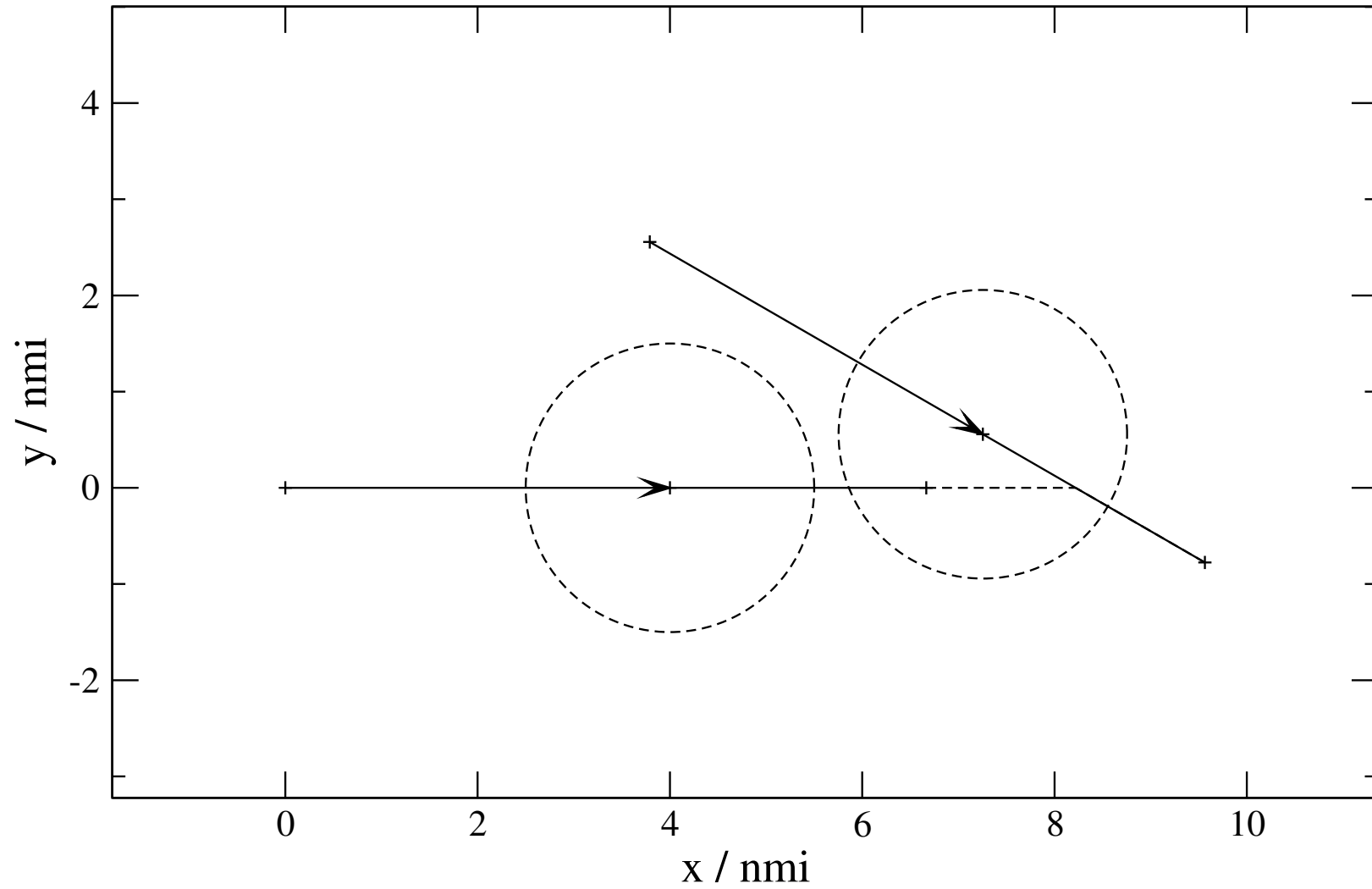
Constant-Velocity Encounter Planview

time: -50.0 sec, angle: 30 deg, min separation: 3.00 nmi



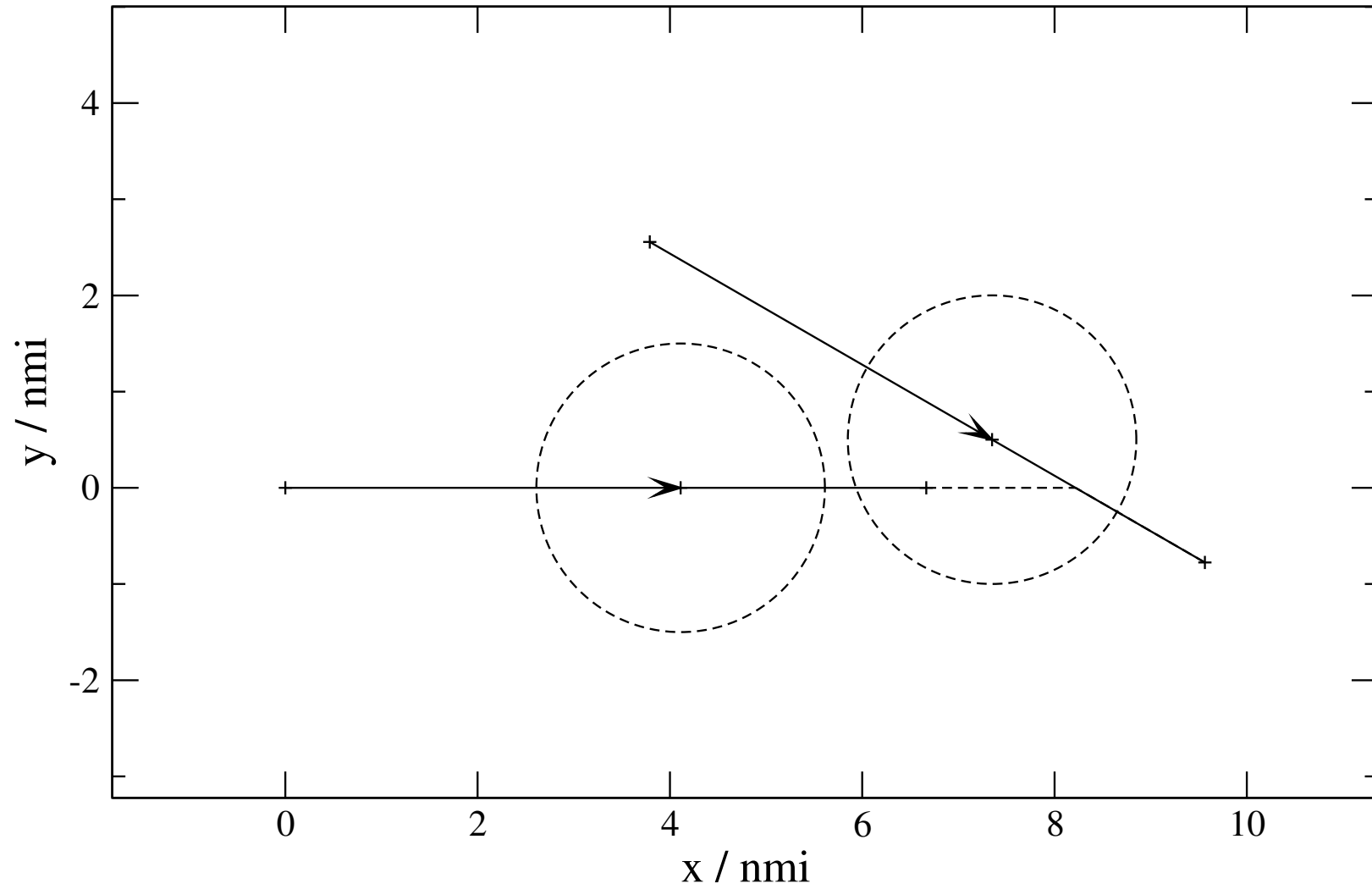
Constant-Velocity Encounter Planview

time: -48.0 sec, angle: 30 deg, min separation: 3.00 nmi



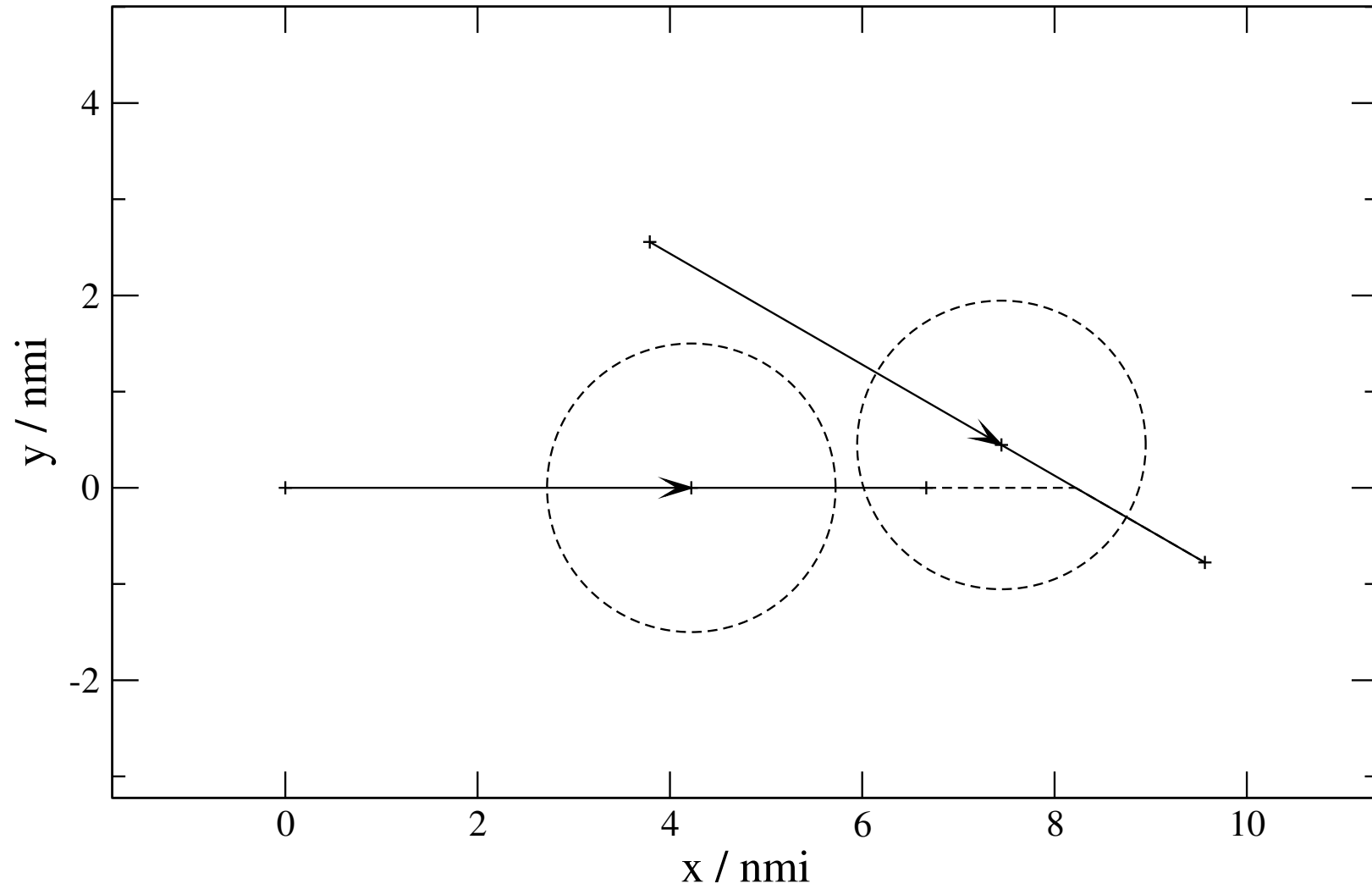
Constant-Velocity Encounter Planview

time: -46.0 sec, angle: 30 deg, min separation: 3.00 nmi



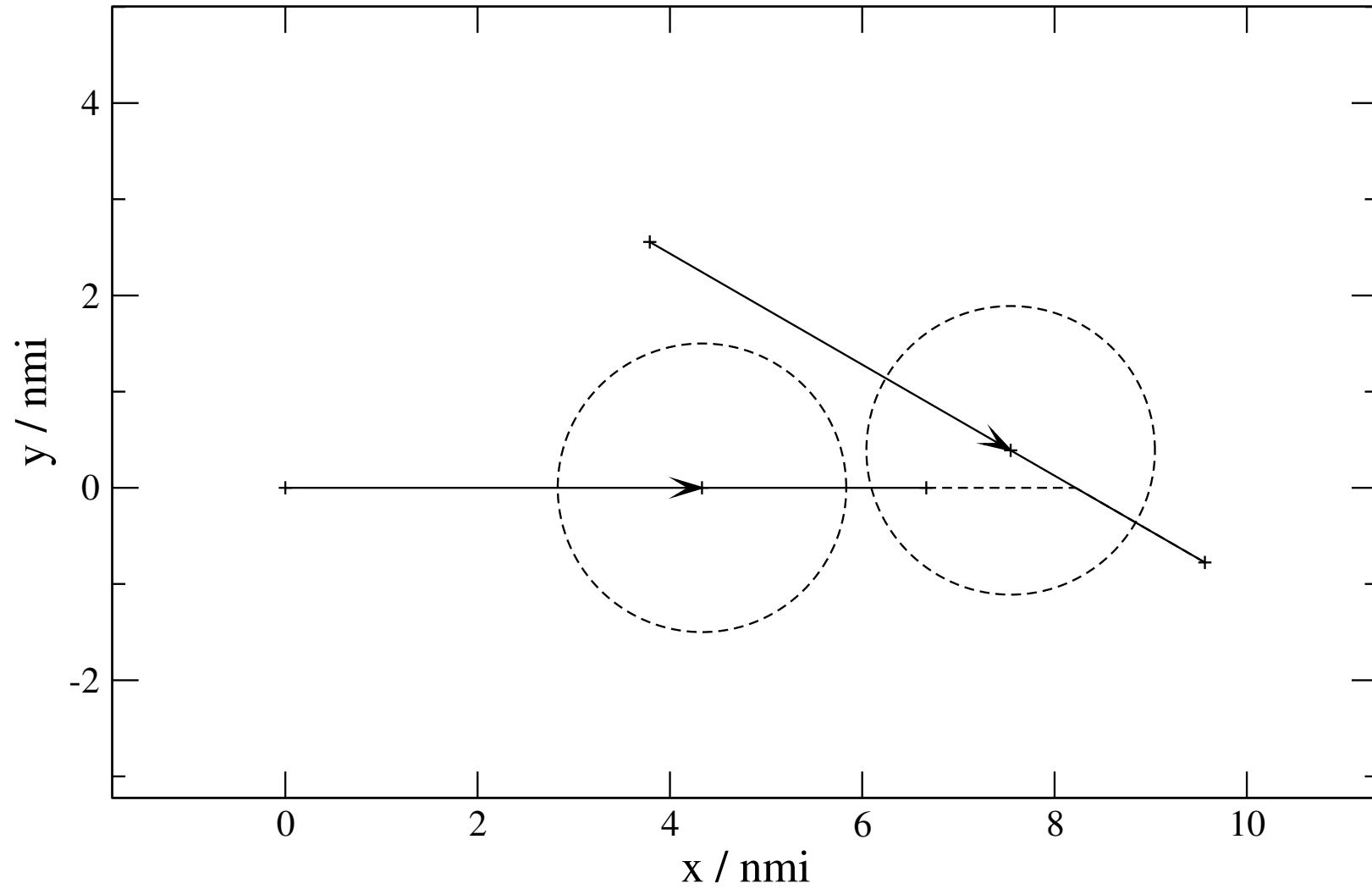
Constant-Velocity Encounter Planview

time: -44.0 sec, angle: 30 deg, min separation: 3.00 nmi



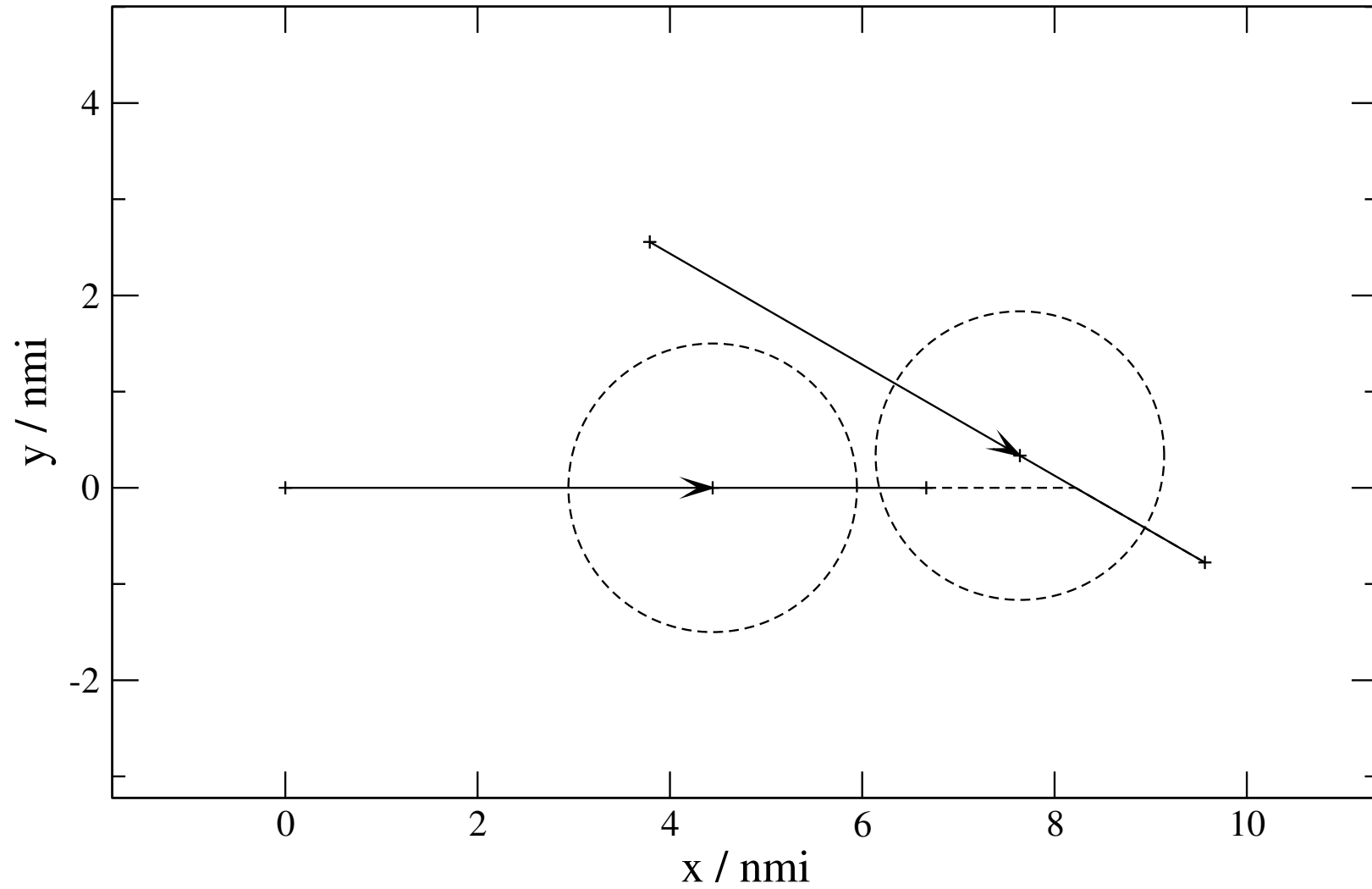
Constant-Velocity Encounter Planview

time: -42.0 sec, angle: 30 deg, min separation: 3.00 nmi



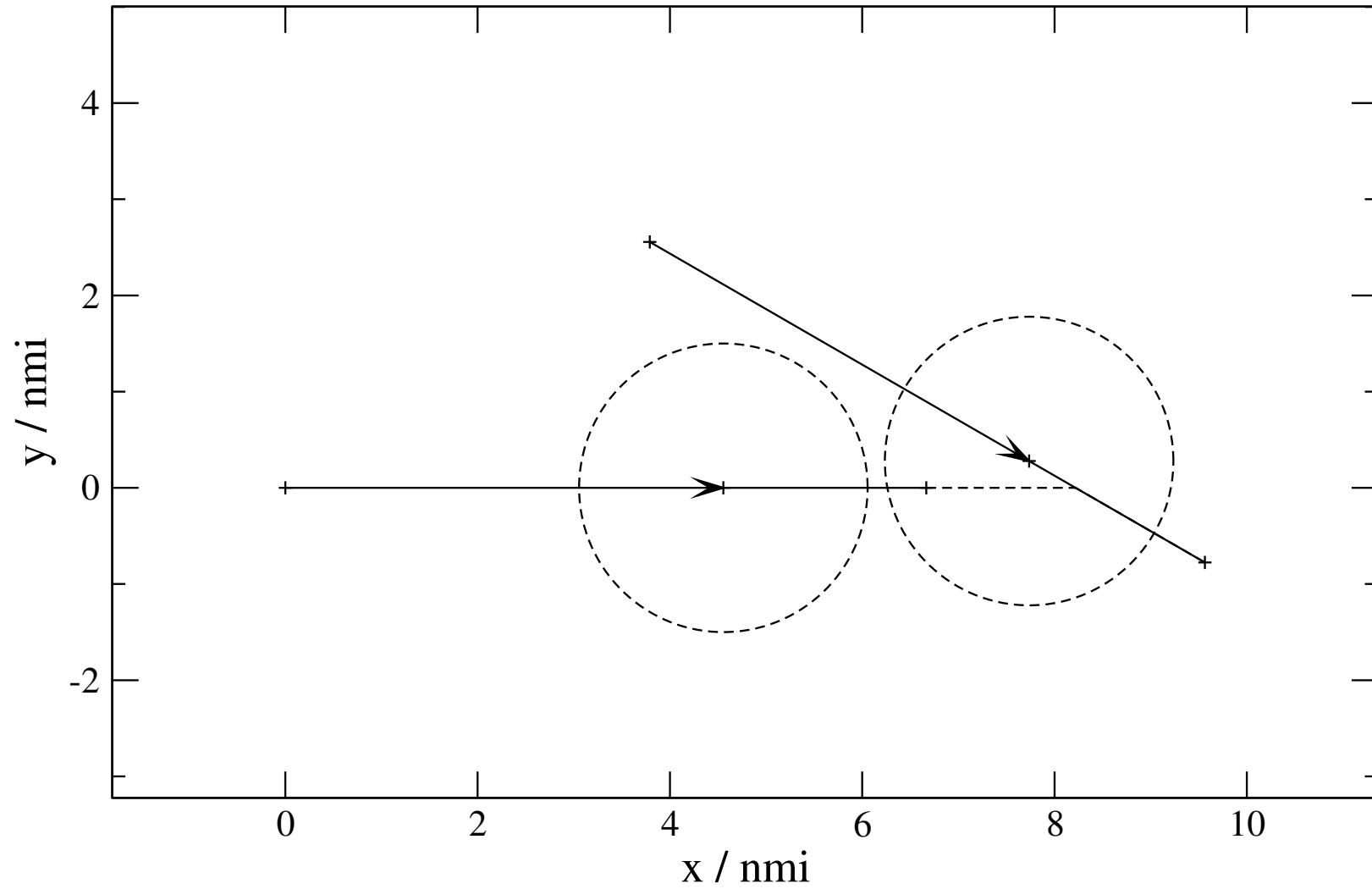
Constant-Velocity Encounter Planview

time: -40.0 sec, angle: 30 deg, min separation: 3.00 nmi



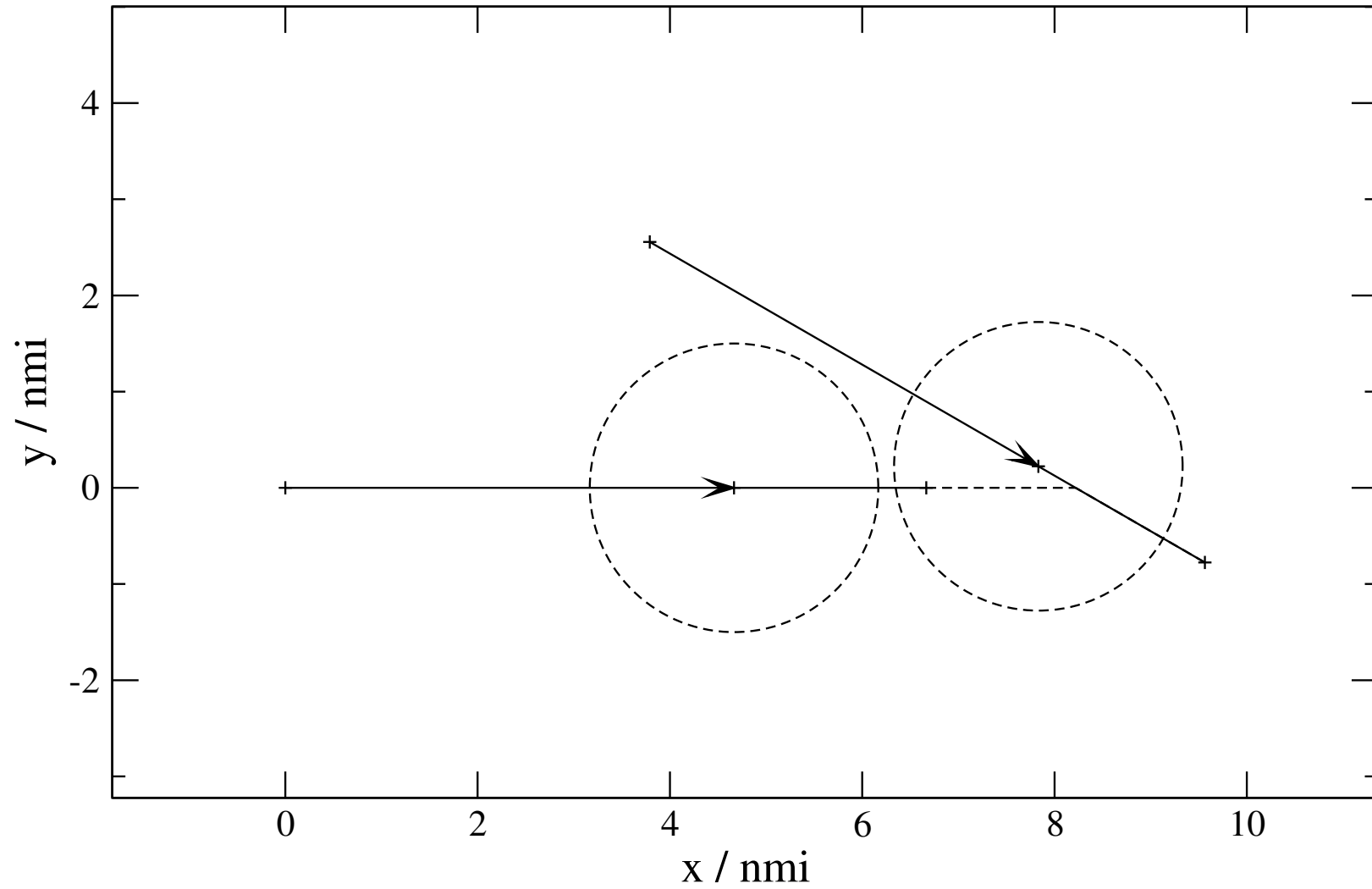
Constant-Velocity Encounter Planview

time: -38.0 sec, angle: 30 deg, min separation: 3.00 nmi



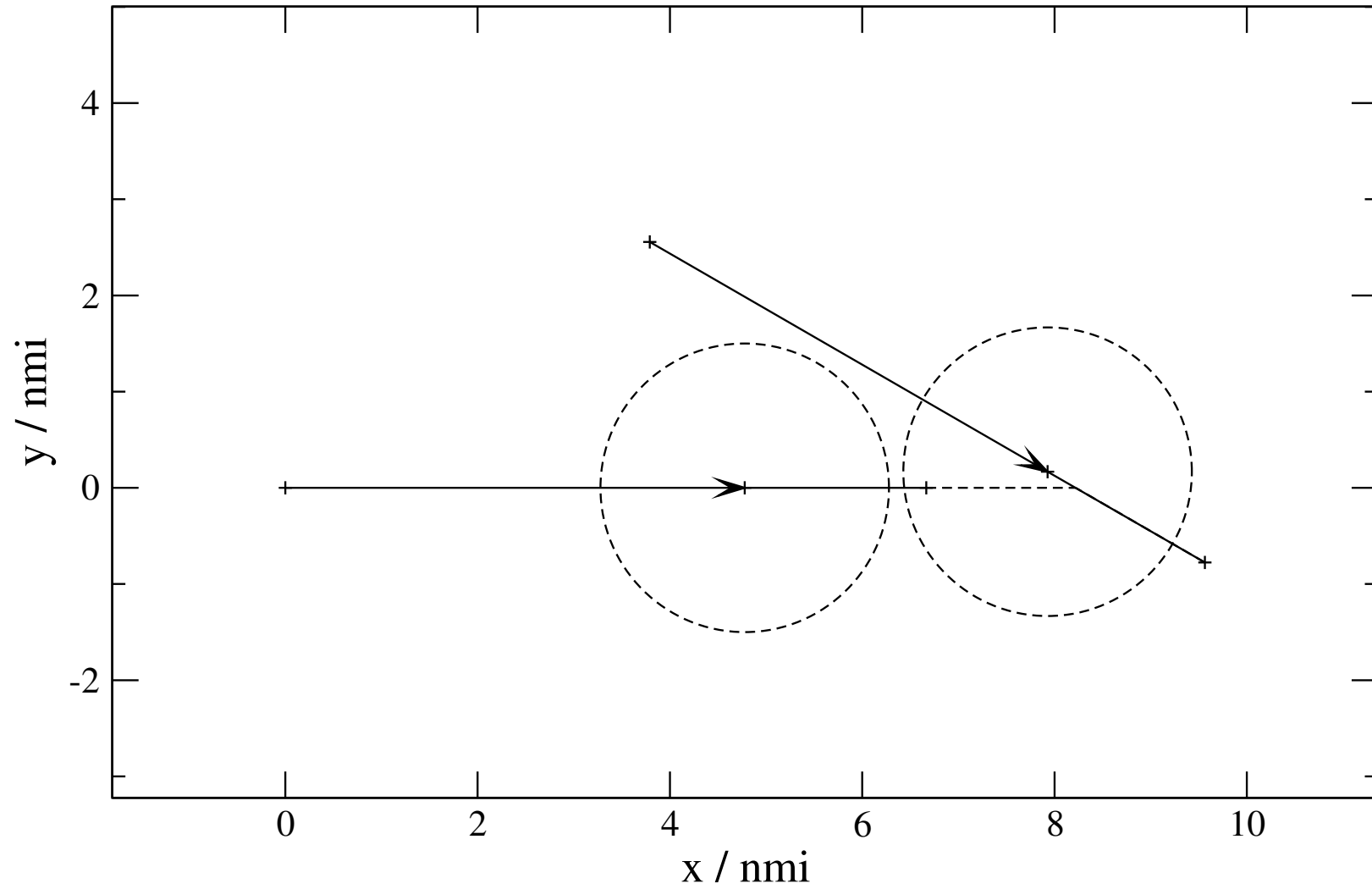
Constant-Velocity Encounter Planview

time: -36.0 sec, angle: 30 deg, min separation: 3.00 nmi



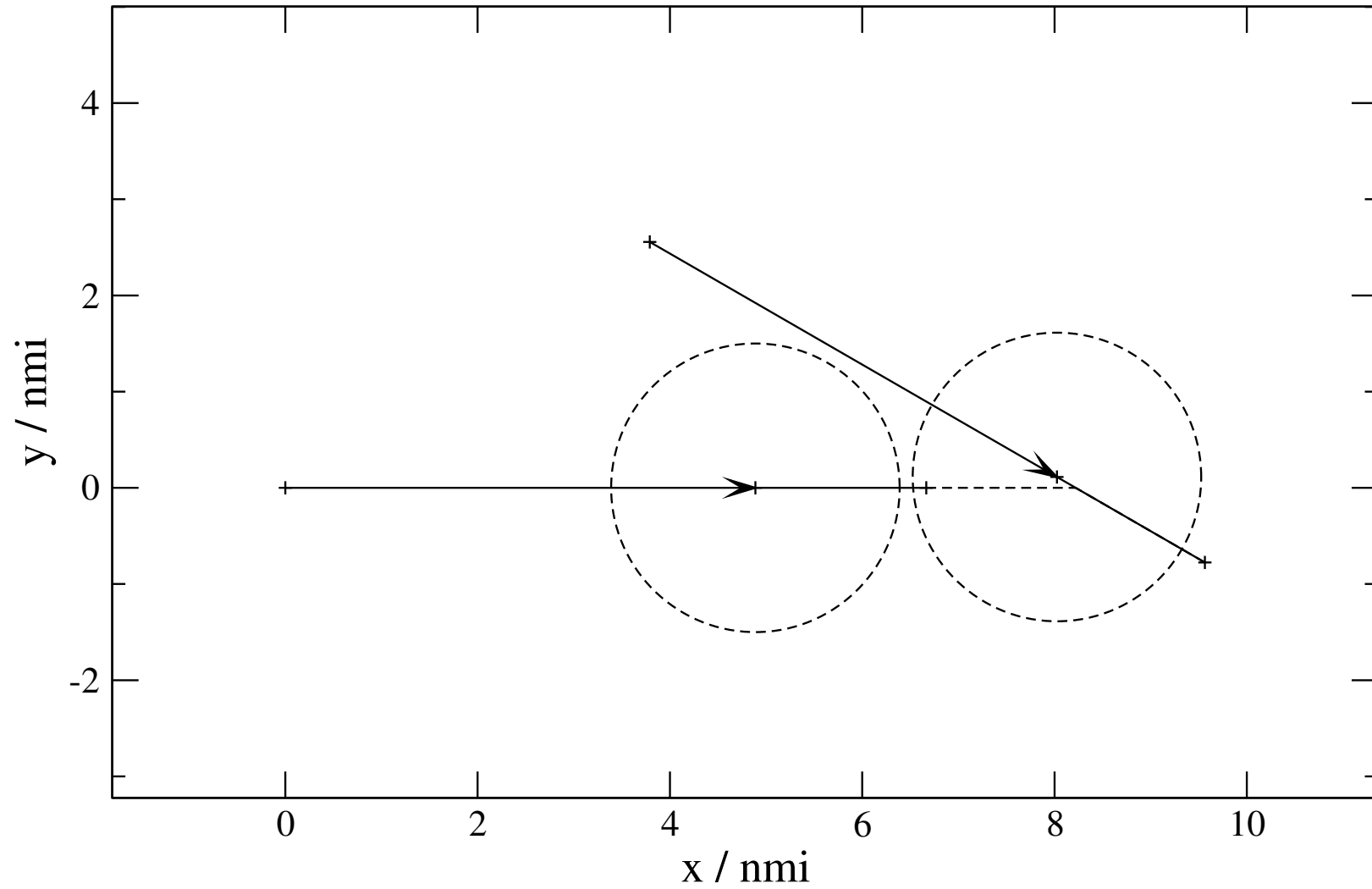
Constant-Velocity Encounter Planview

time: -34.0 sec, angle: 30 deg, min separation: 3.00 nmi



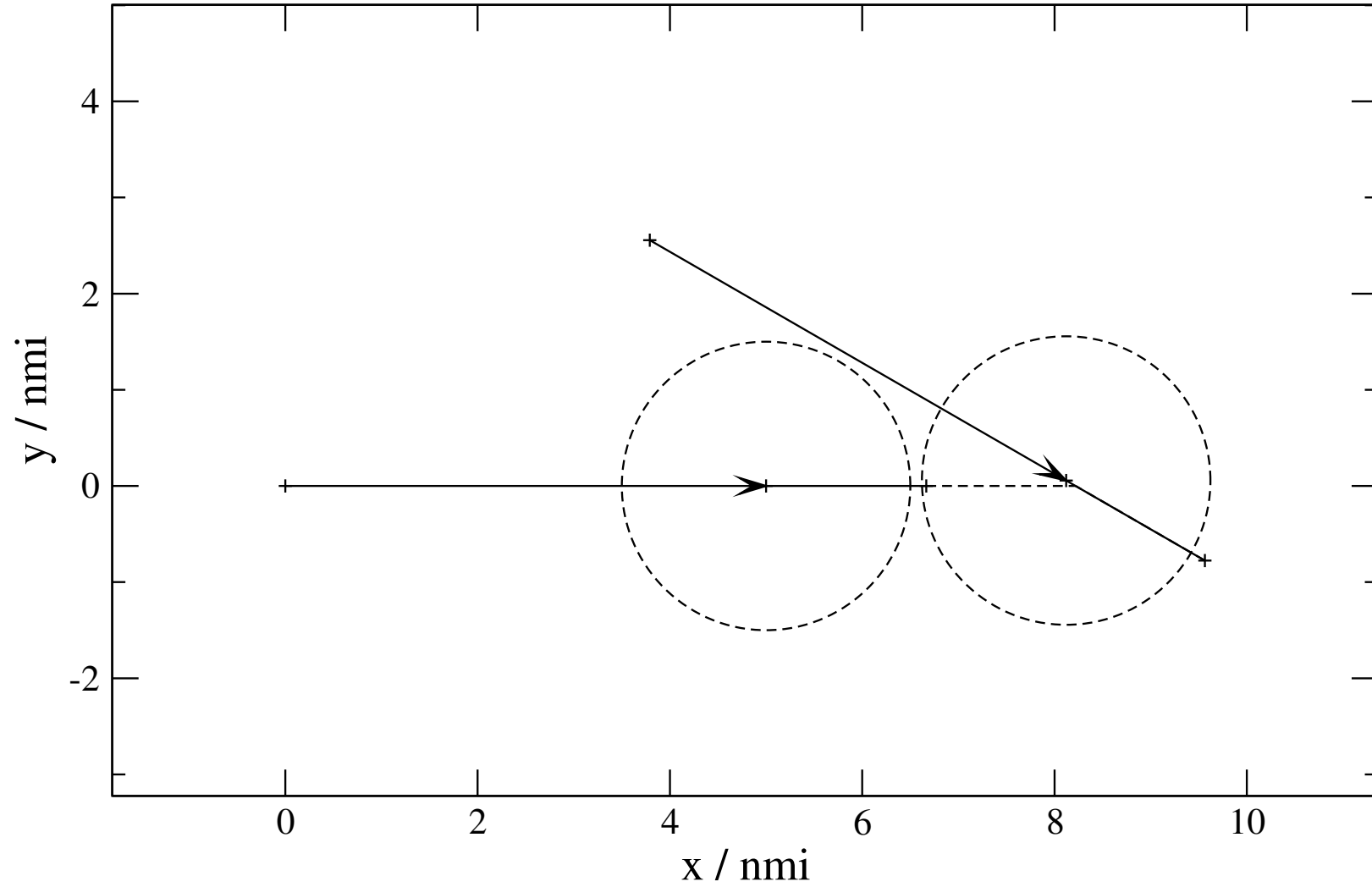
Constant-Velocity Encounter Planview

time: -32.0 sec, angle: 30 deg, min separation: 3.00 nmi



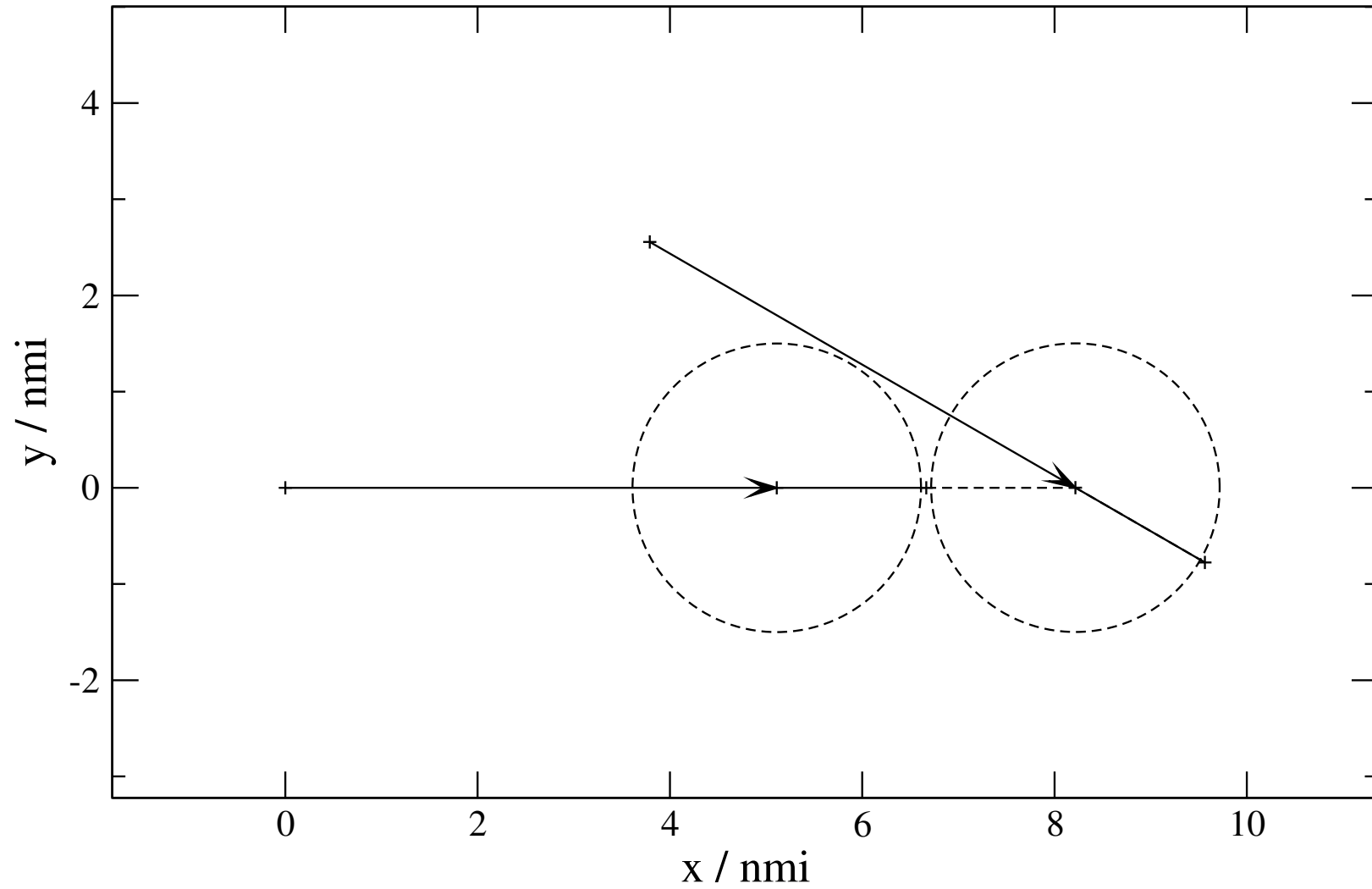
Constant-Velocity Encounter Planview

time: -30.0 sec, angle: 30 deg, min separation: 3.00 nmi



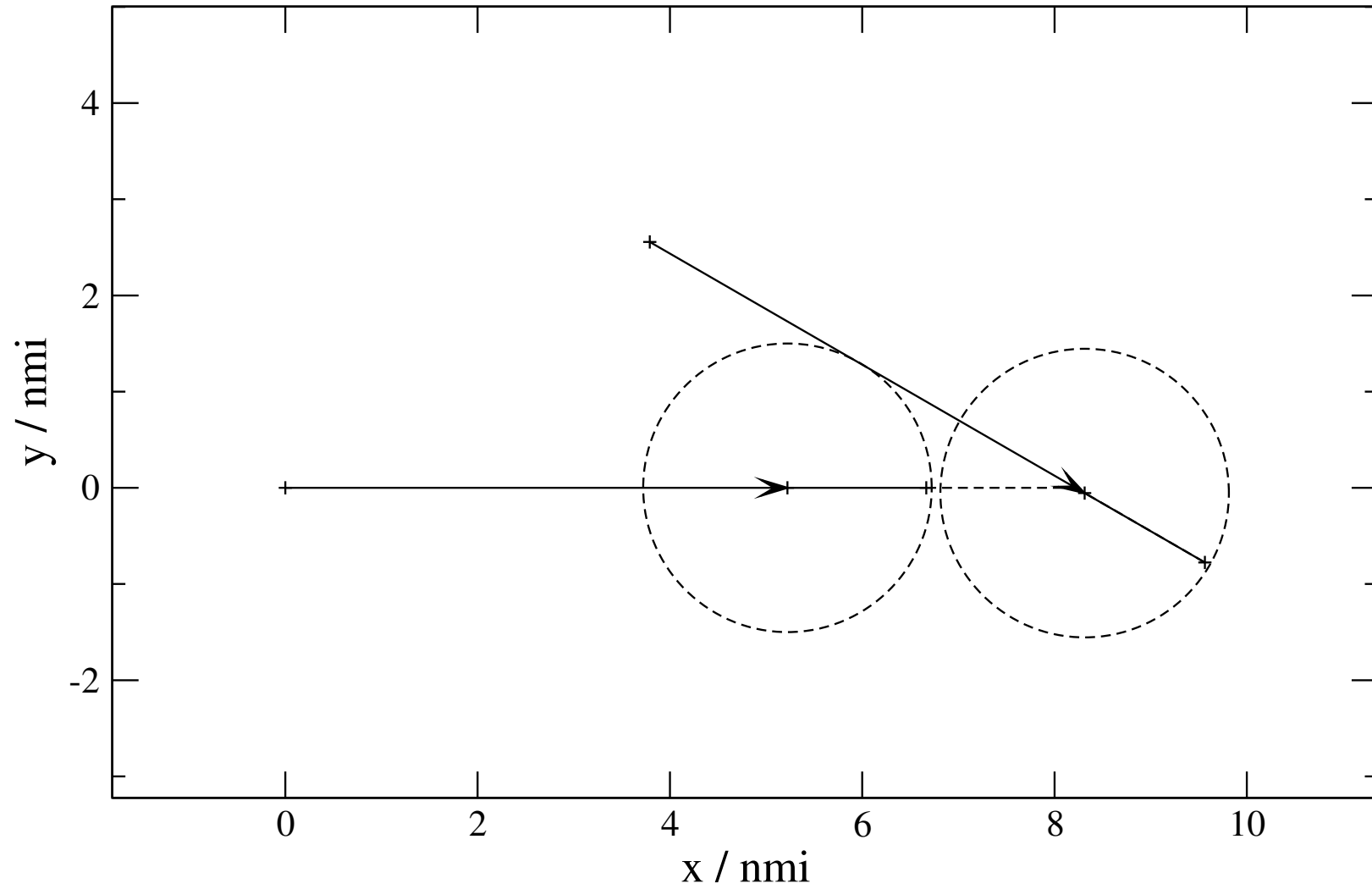
Constant-Velocity Encounter Planview

time: -28.0 sec, angle: 30 deg, min separation: 3.00 nmi



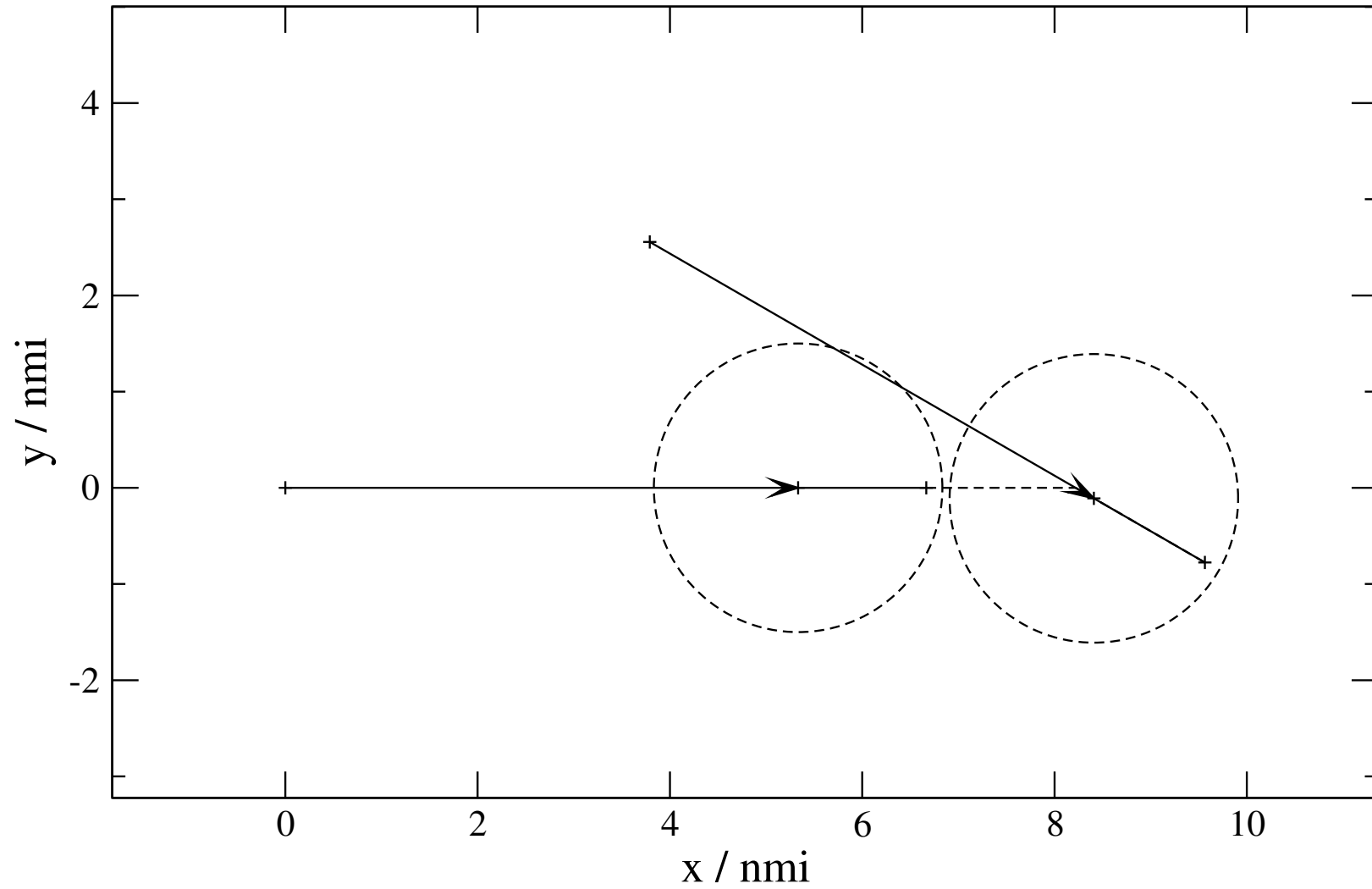
Constant-Velocity Encounter Planview

time: -26.0 sec, angle: 30 deg, min separation: 3.00 nmi



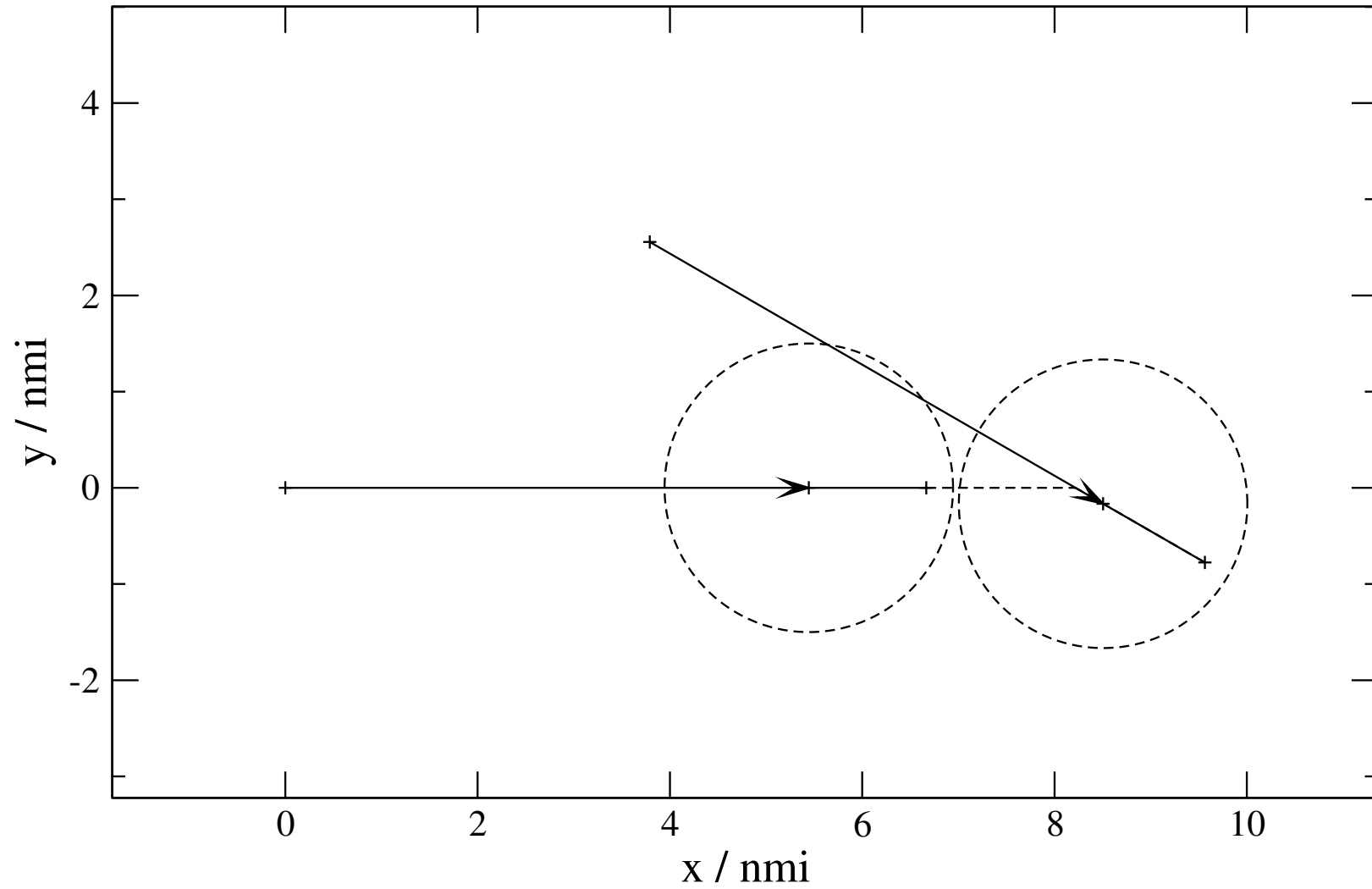
Constant-Velocity Encounter Planview

time: -24.0 sec, angle: 30 deg, min separation: 3.00 nmi



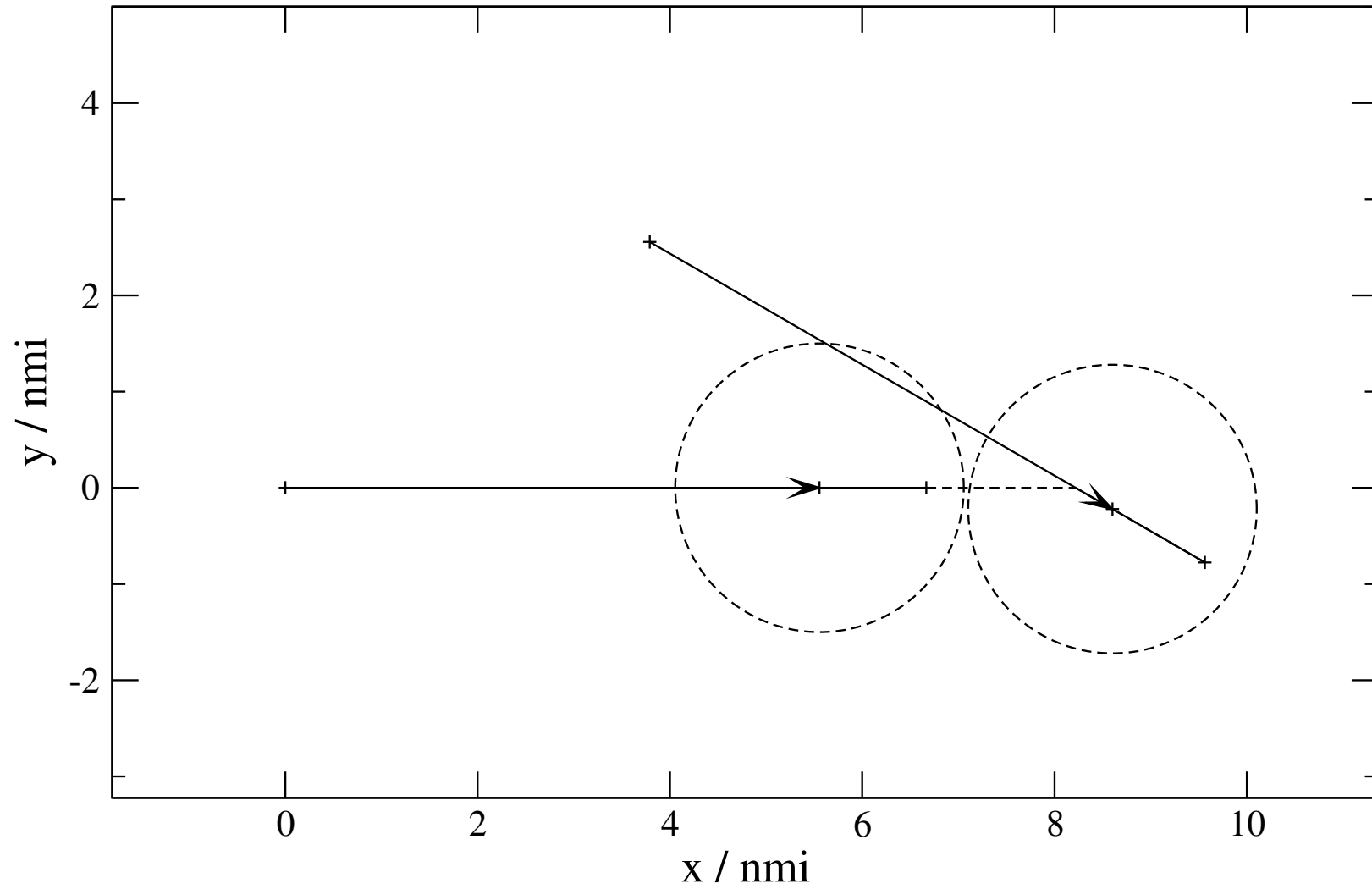
Constant-Velocity Encounter Planview

time: -22.0 sec, angle: 30 deg, min separation: 3.00 nmi



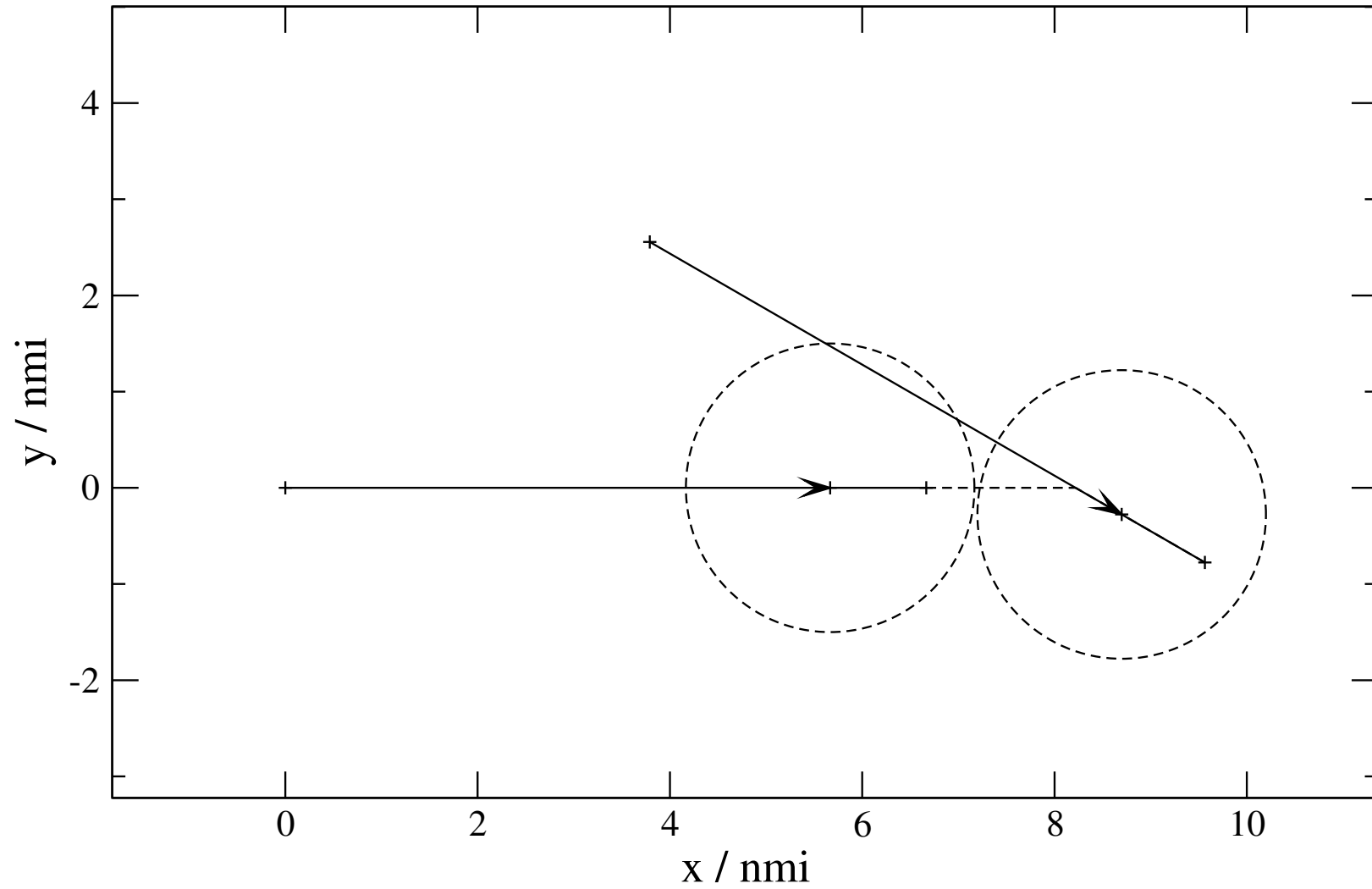
Constant-Velocity Encounter Planview

time: -20.0 sec, angle: 30 deg, min separation: 3.00 nmi



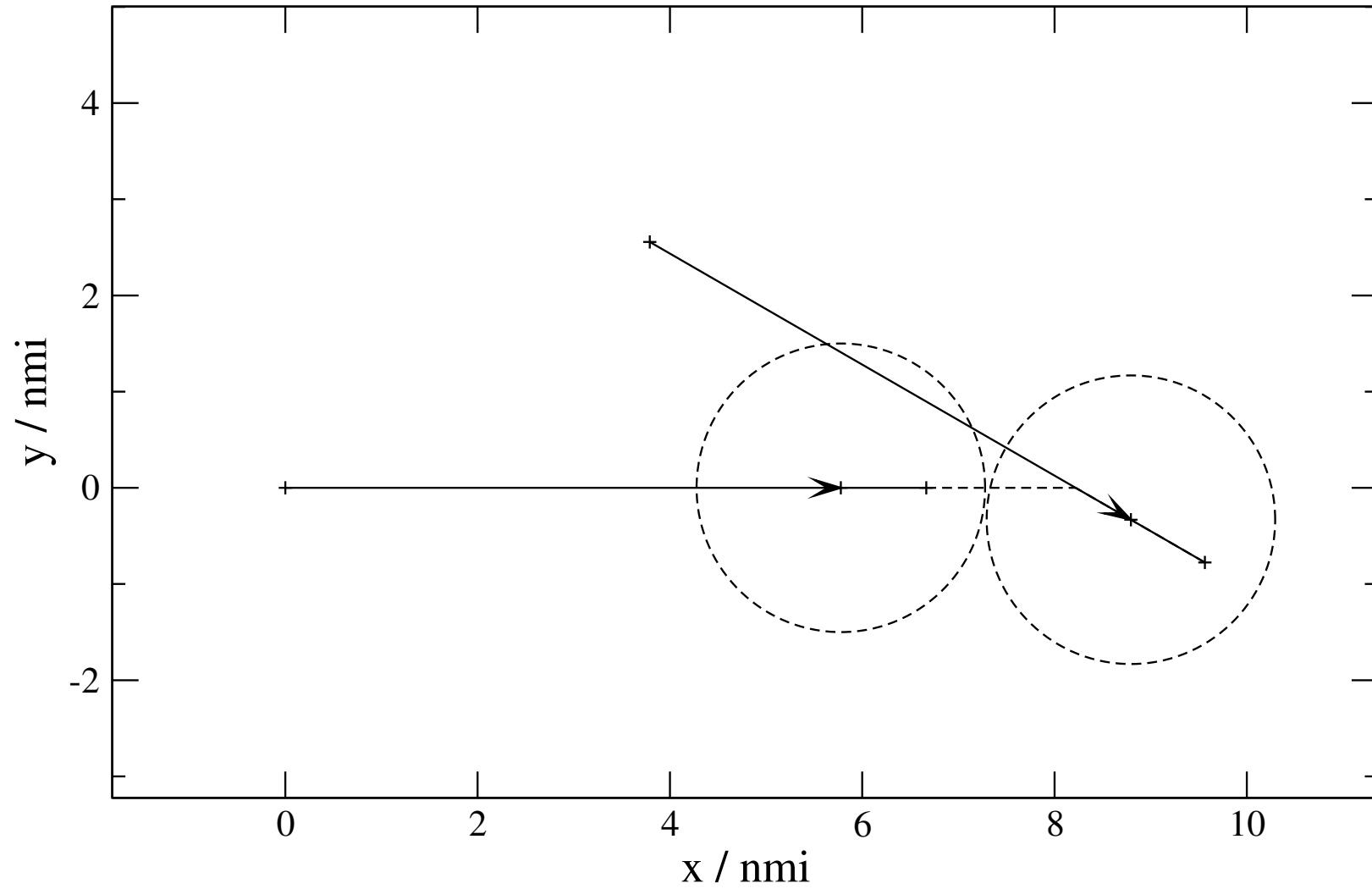
Constant-Velocity Encounter Planview

time: -18.0 sec, angle: 30 deg, min separation: 3.00 nmi



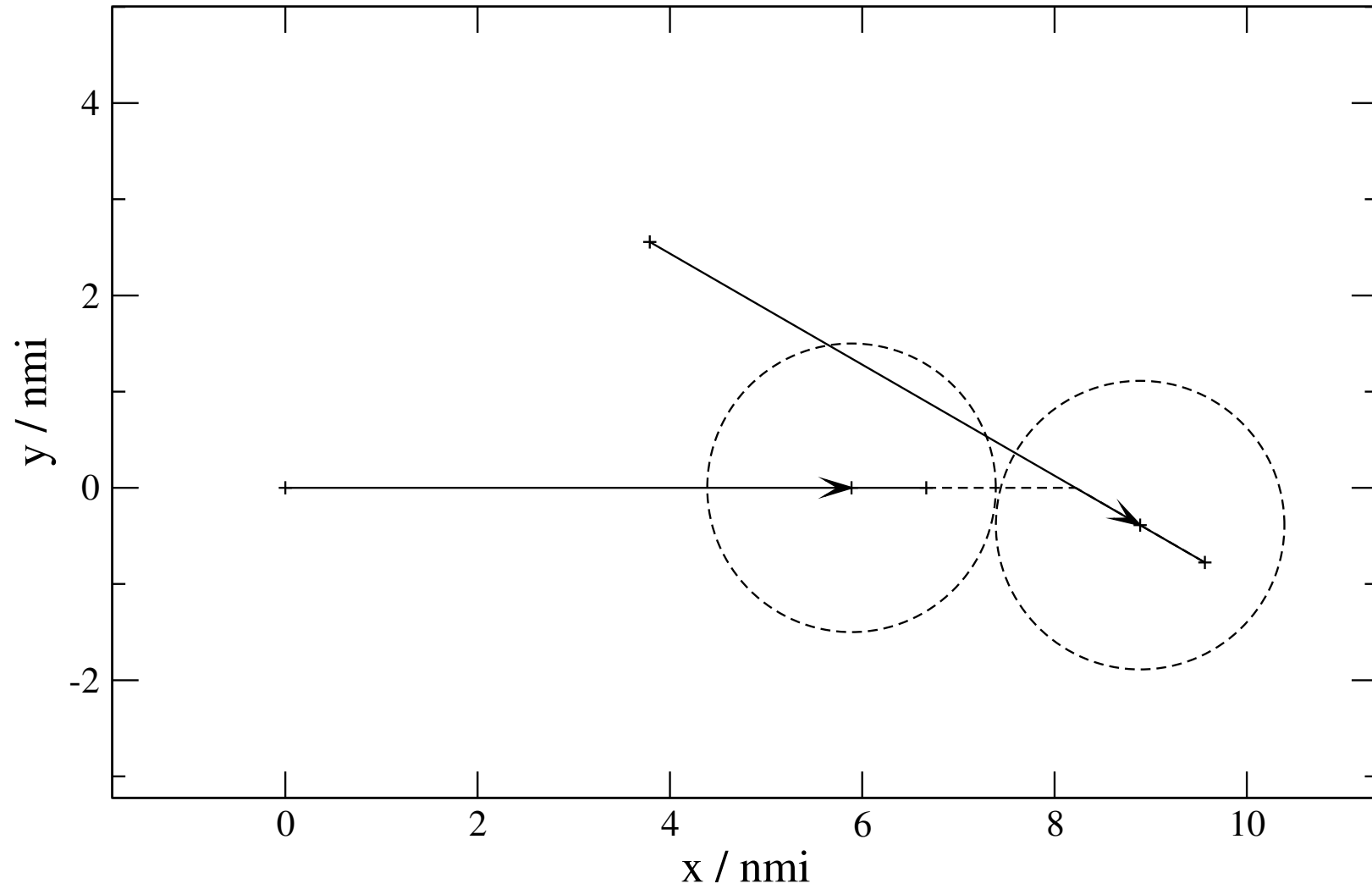
Constant-Velocity Encounter Planview

time: -16.0 sec, angle: 30 deg, min separation: 3.00 nmi



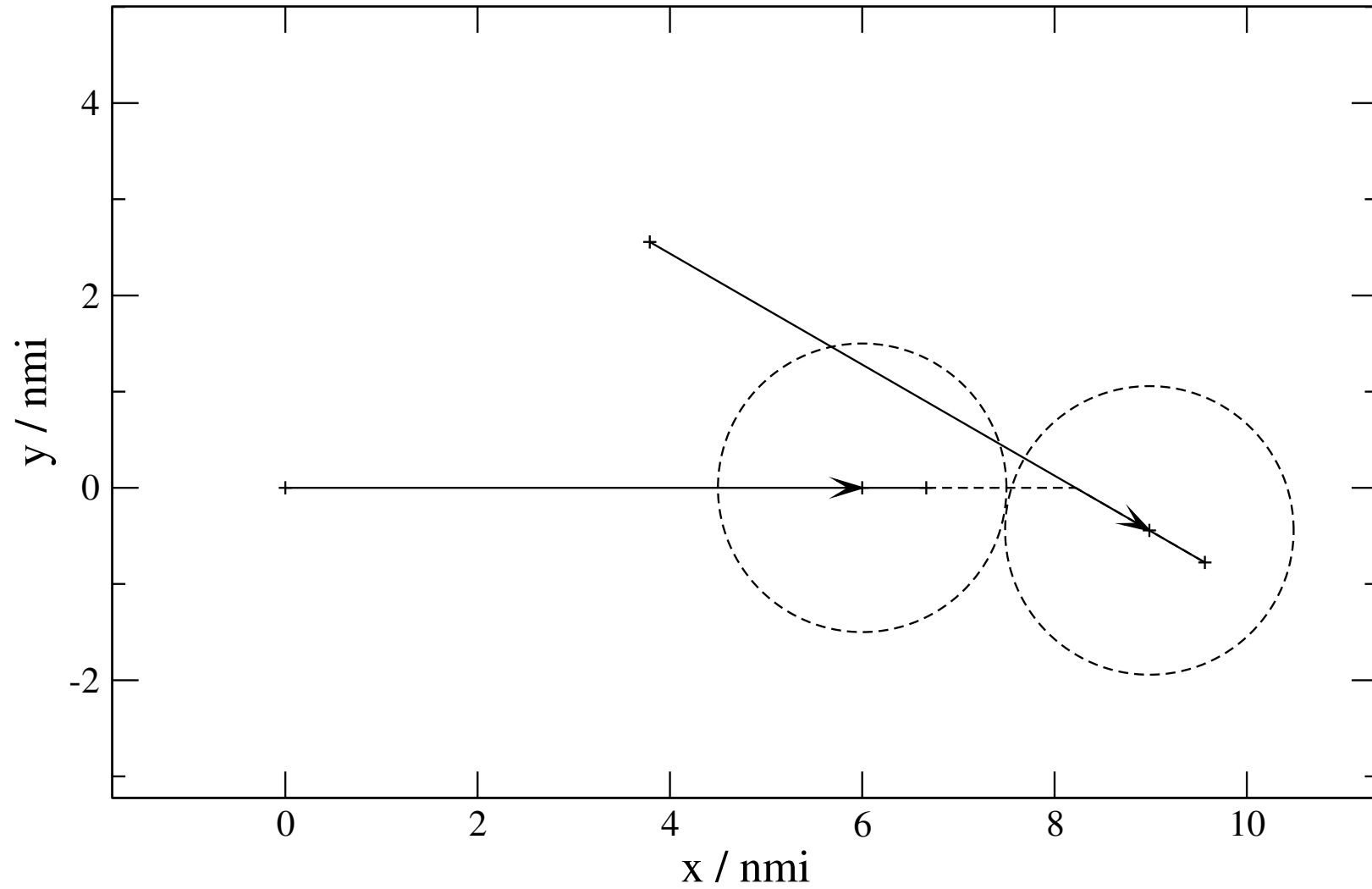
Constant-Velocity Encounter Planview

time: -14.0 sec, angle: 30 deg, min separation: 3.00 nmi



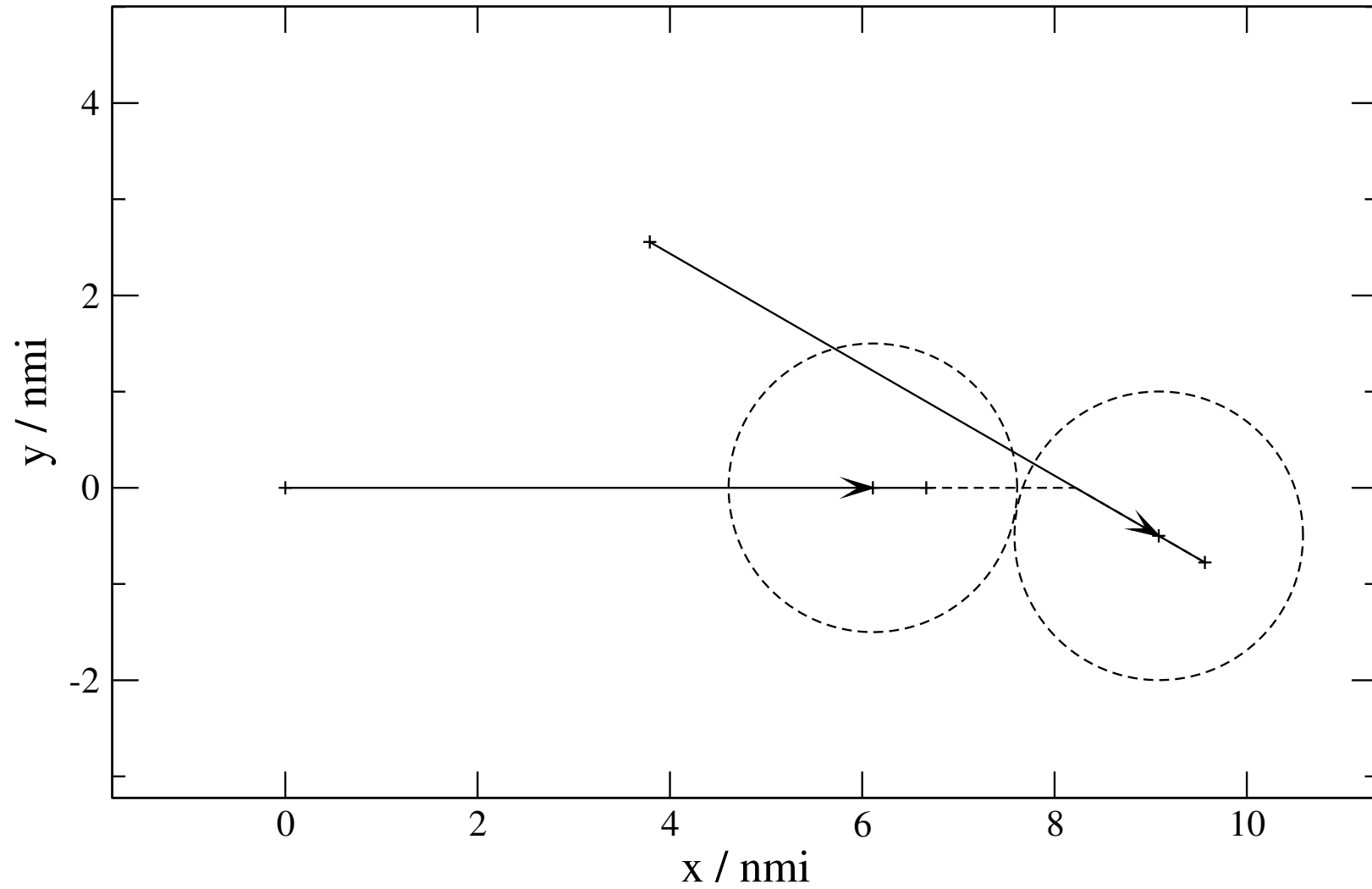
Constant-Velocity Encounter Planview

time: -12.0 sec, angle: 30 deg, min separation: 3.00 nmi



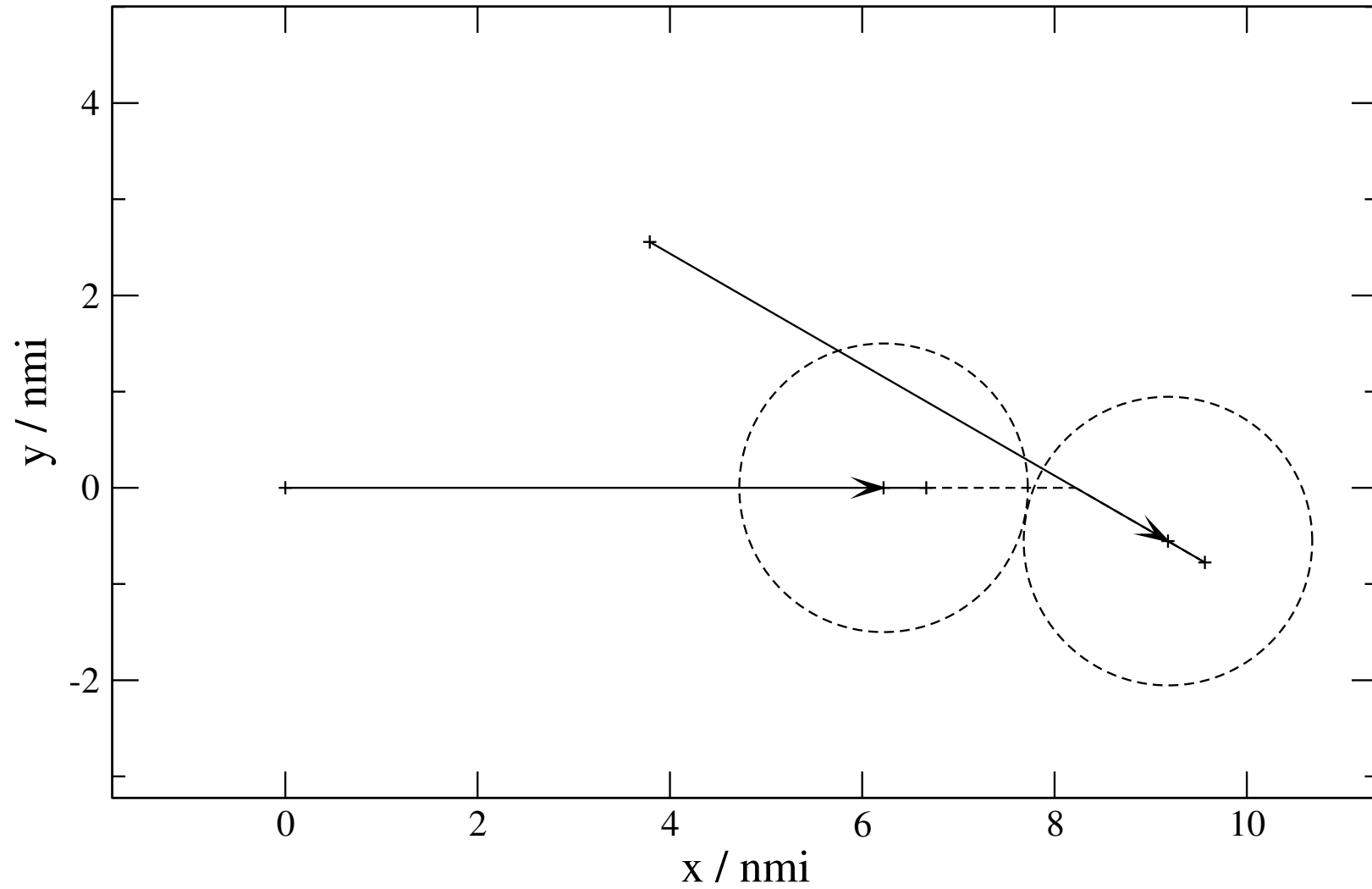
Constant-Velocity Encounter Planview

time: -10.0 sec, angle: 30 deg, min separation: 3.00 nmi



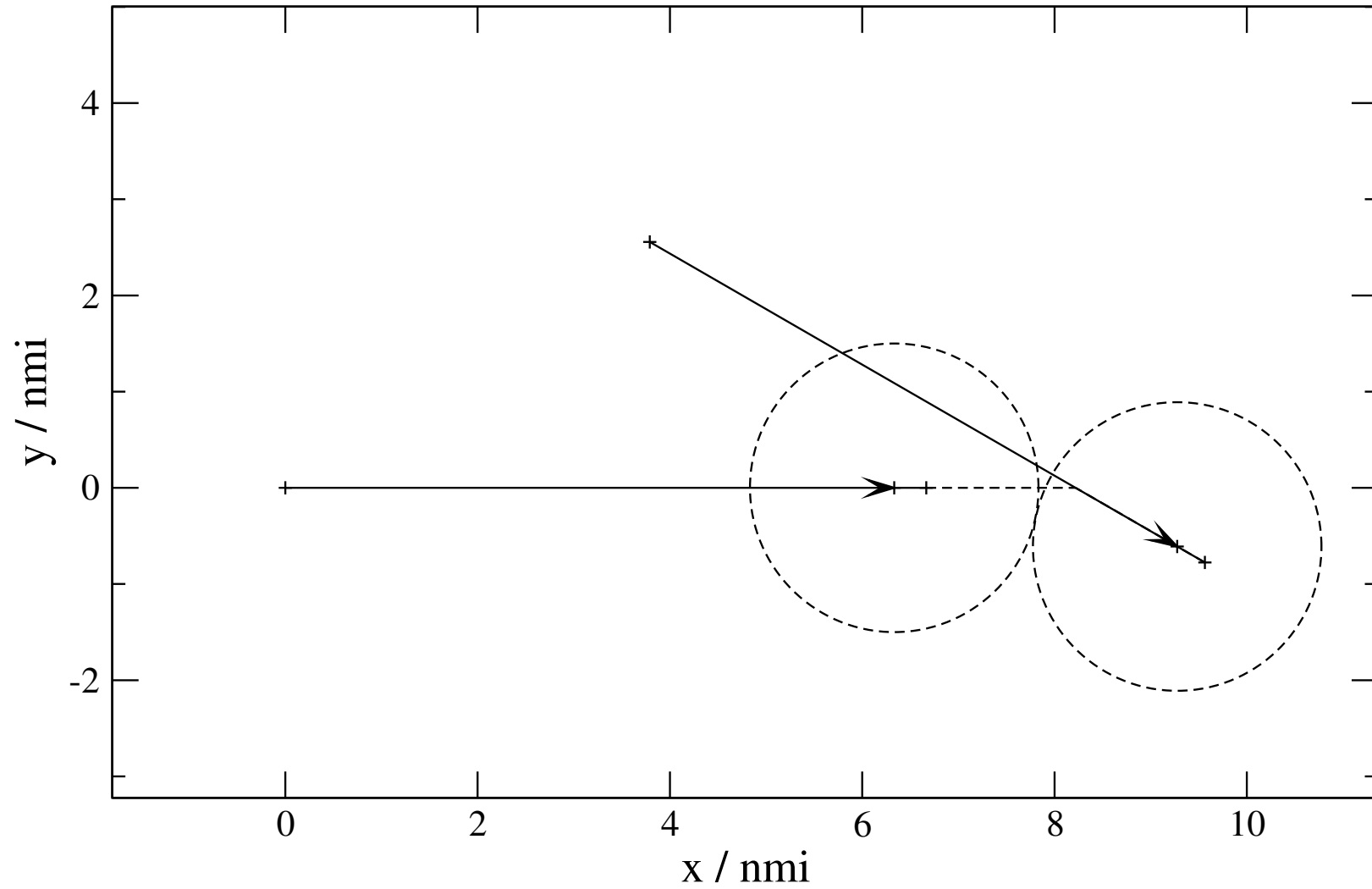
Constant-Velocity Encounter Planview

time: -8.0 sec, angle: 30 deg, min separation: 3.00 nmi



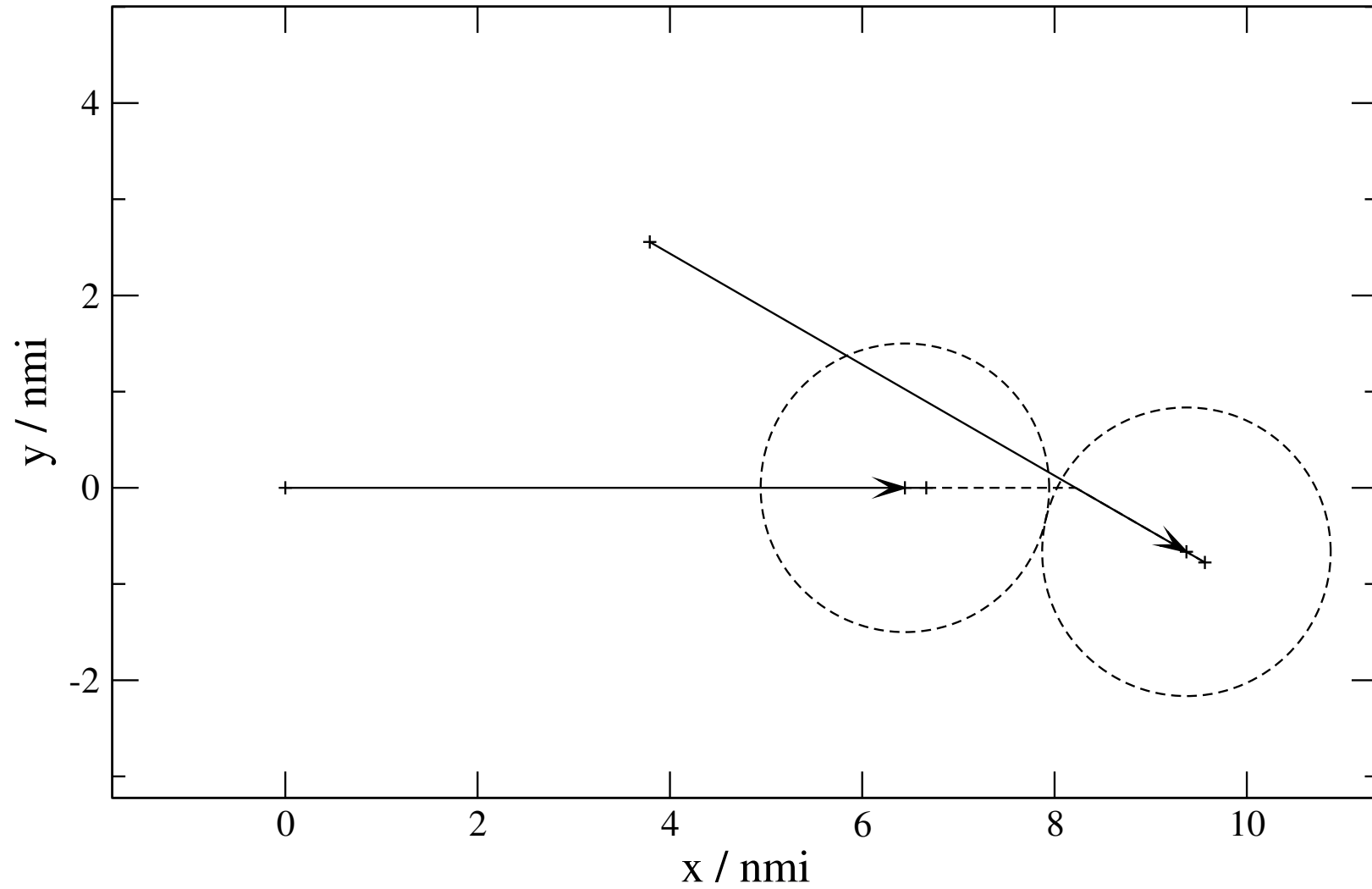
Constant-Velocity Encounter Planview

time: -6.0 sec, angle: 30 deg, min separation: 3.00 nmi



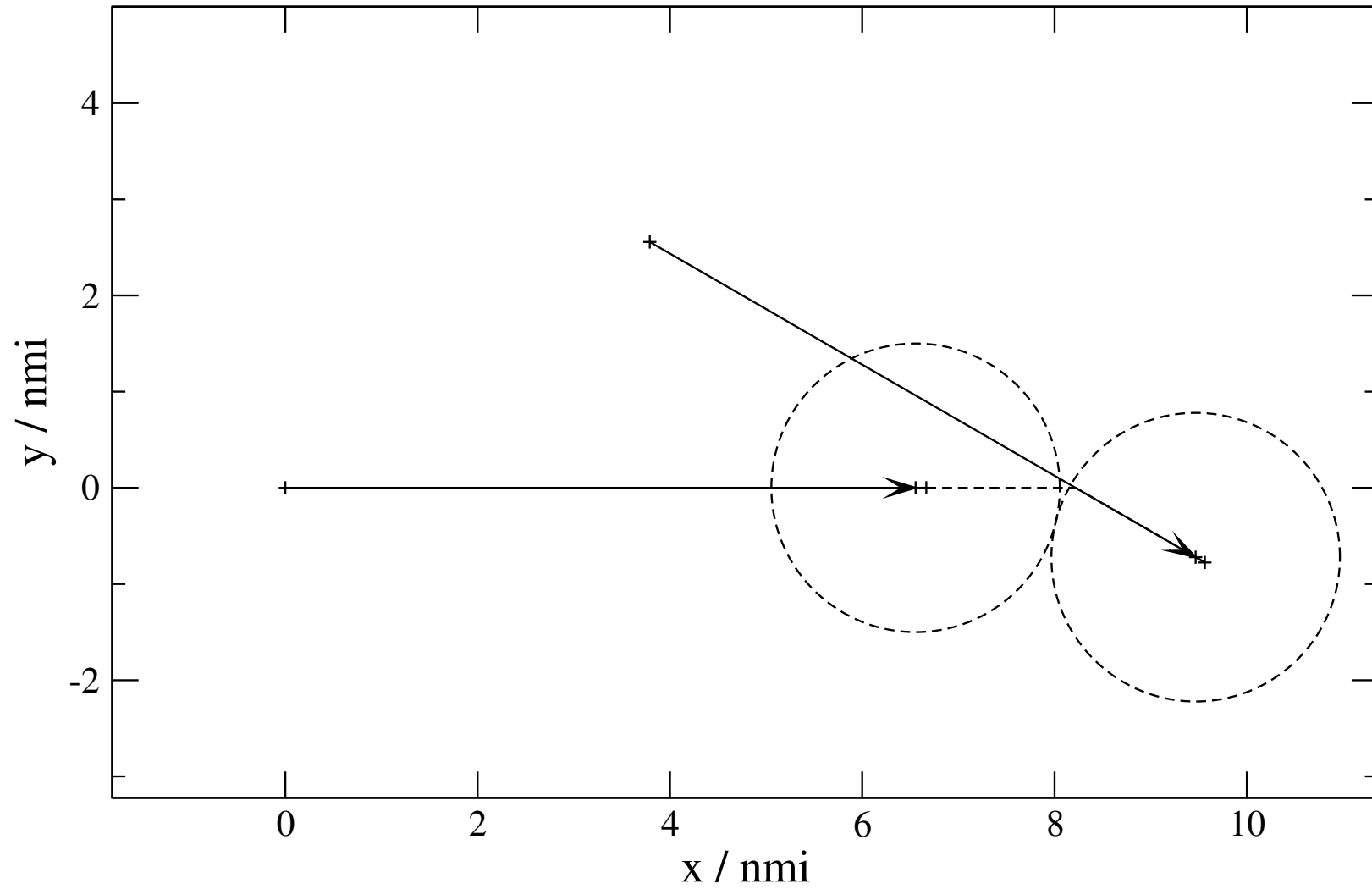
Constant-Velocity Encounter Planview

time: -4.0 sec, angle: 30 deg, min separation: 3.00 nmi



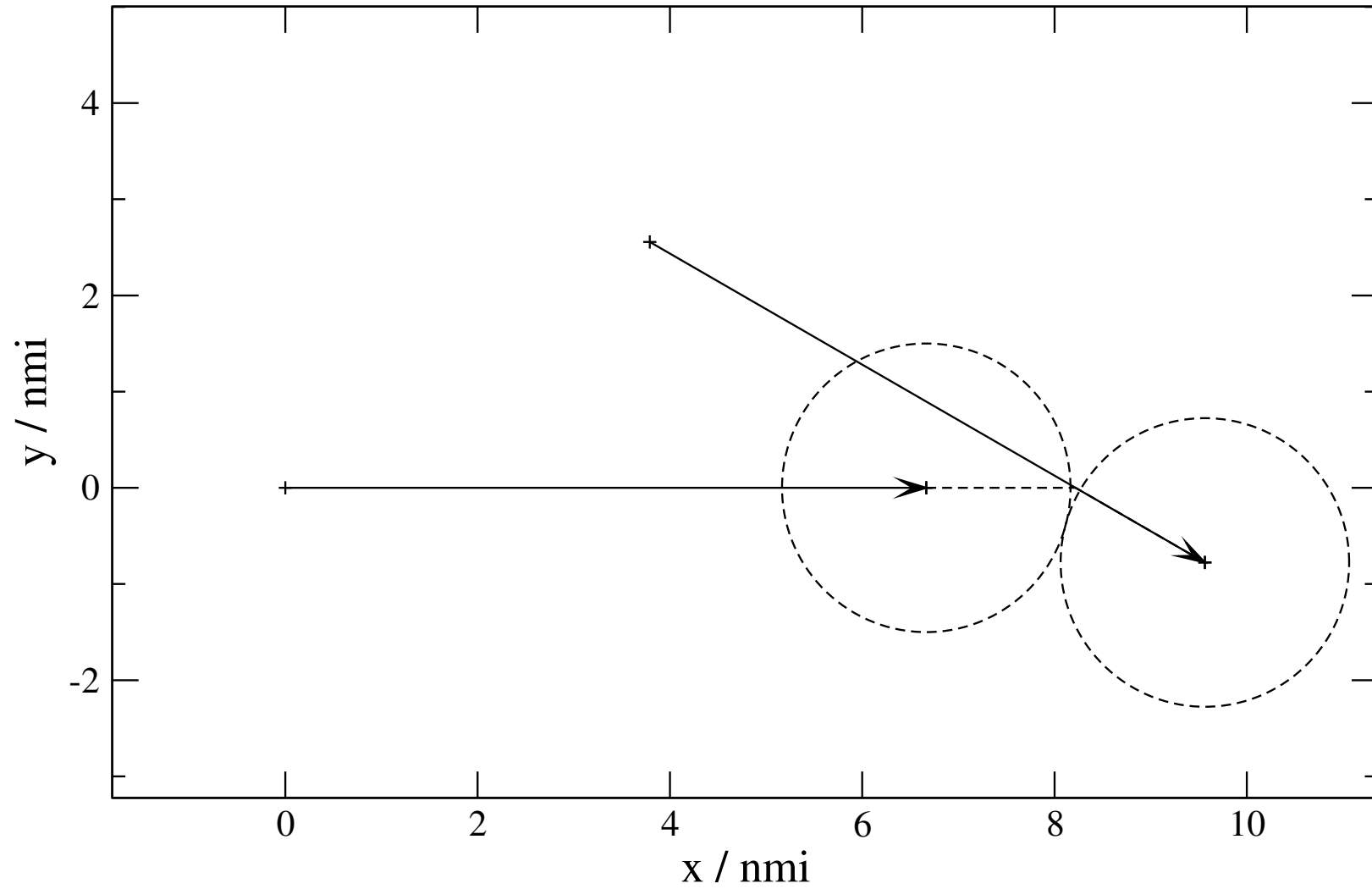
Constant-Velocity Encounter Planview

time: -2.0 sec, angle: 30 deg, min separation: 3.00 nmi



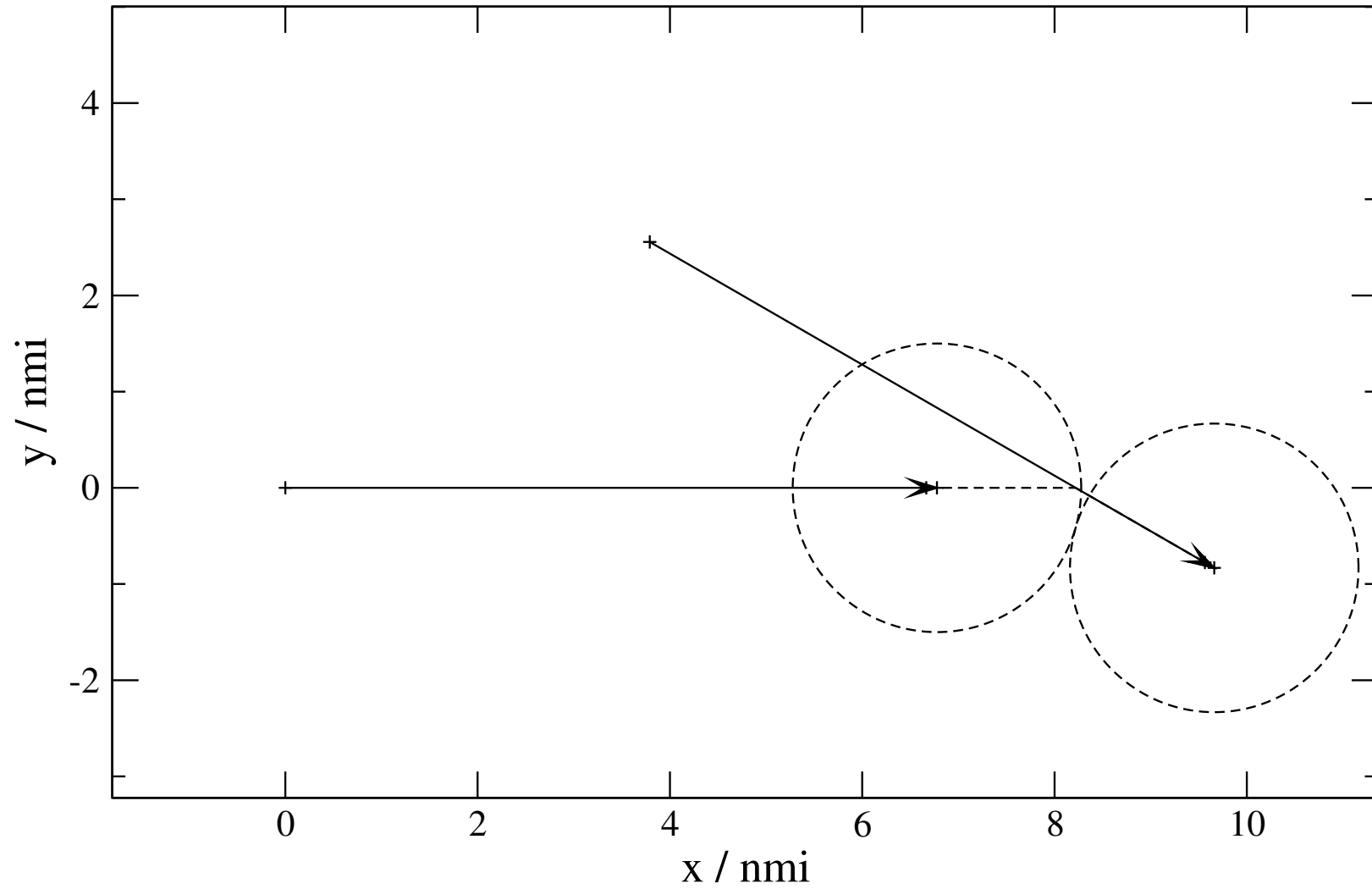
Constant-Velocity Encounter Planview

time: +0.0 sec, angle: 30 deg, min separation: 3.00 nmi



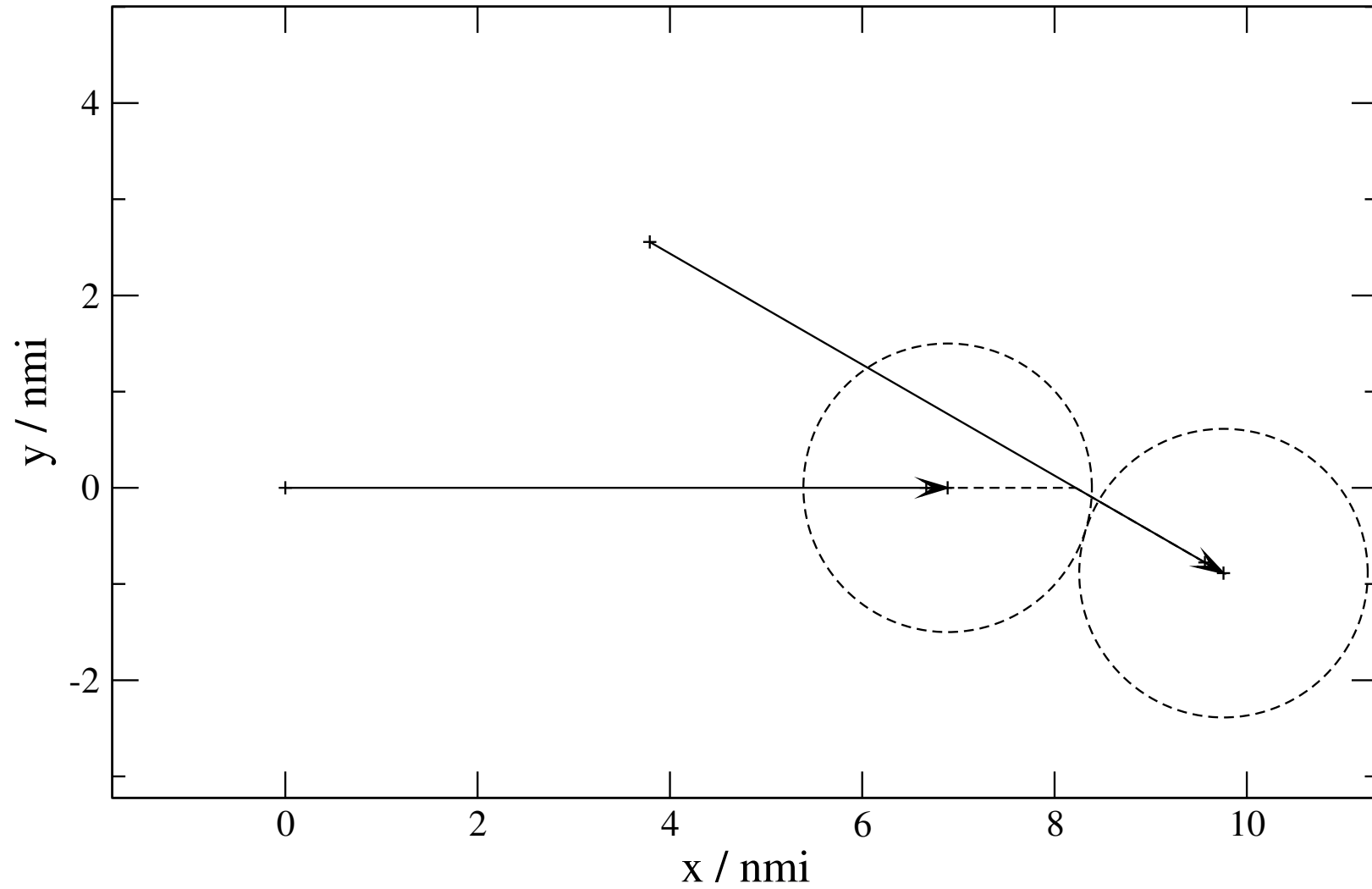
Constant-Velocity Encounter Planview

time: +2.0 sec, angle: 30 deg, min separation: 3.00 nmi



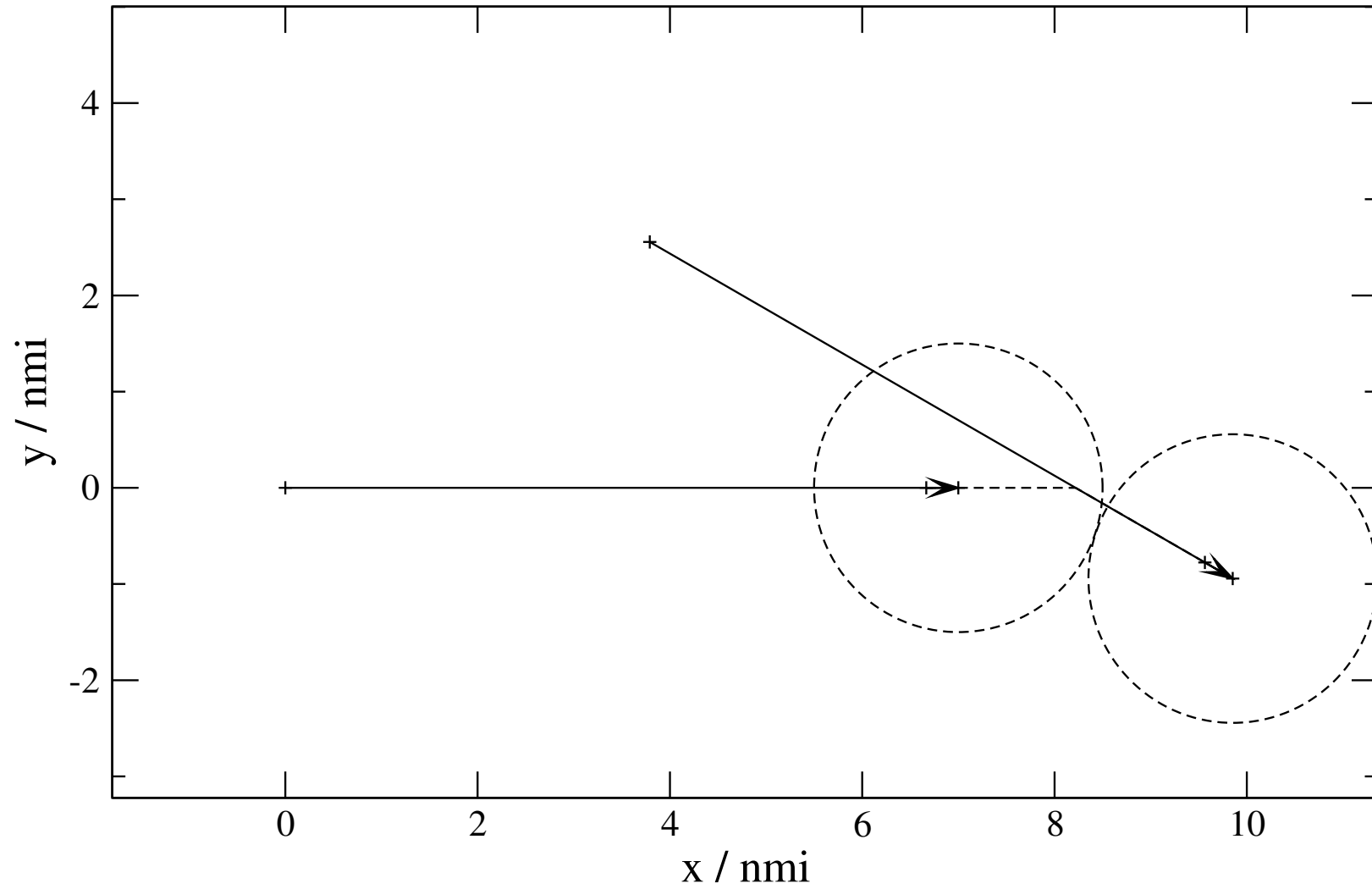
Constant-Velocity Encounter Planview

time: +4.0 sec, angle: 30 deg, min separation: 3.00 nmi



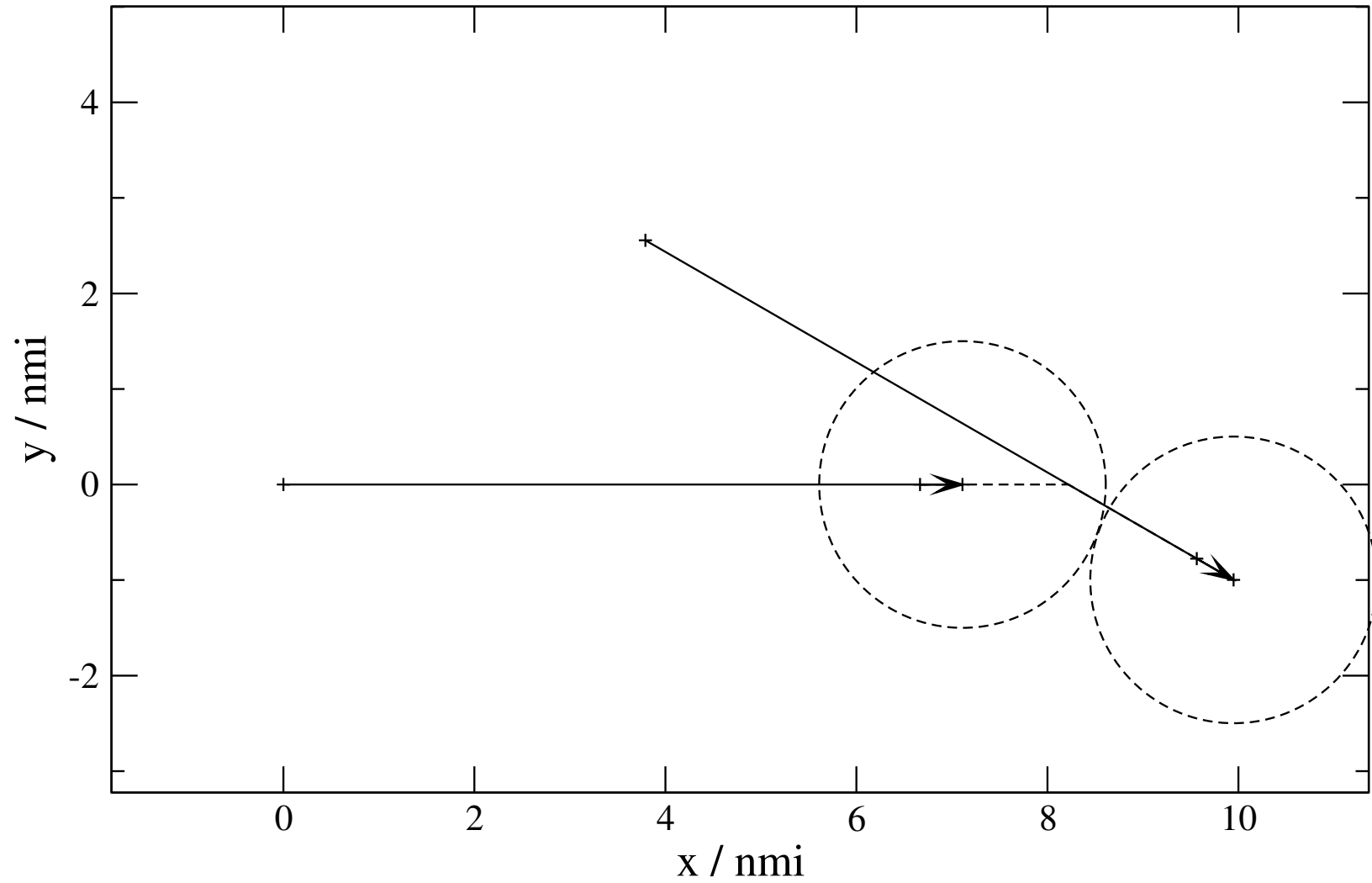
Constant-Velocity Encounter Planview

time: +6.0 sec, angle: 30 deg, min separation: 3.00 nmi



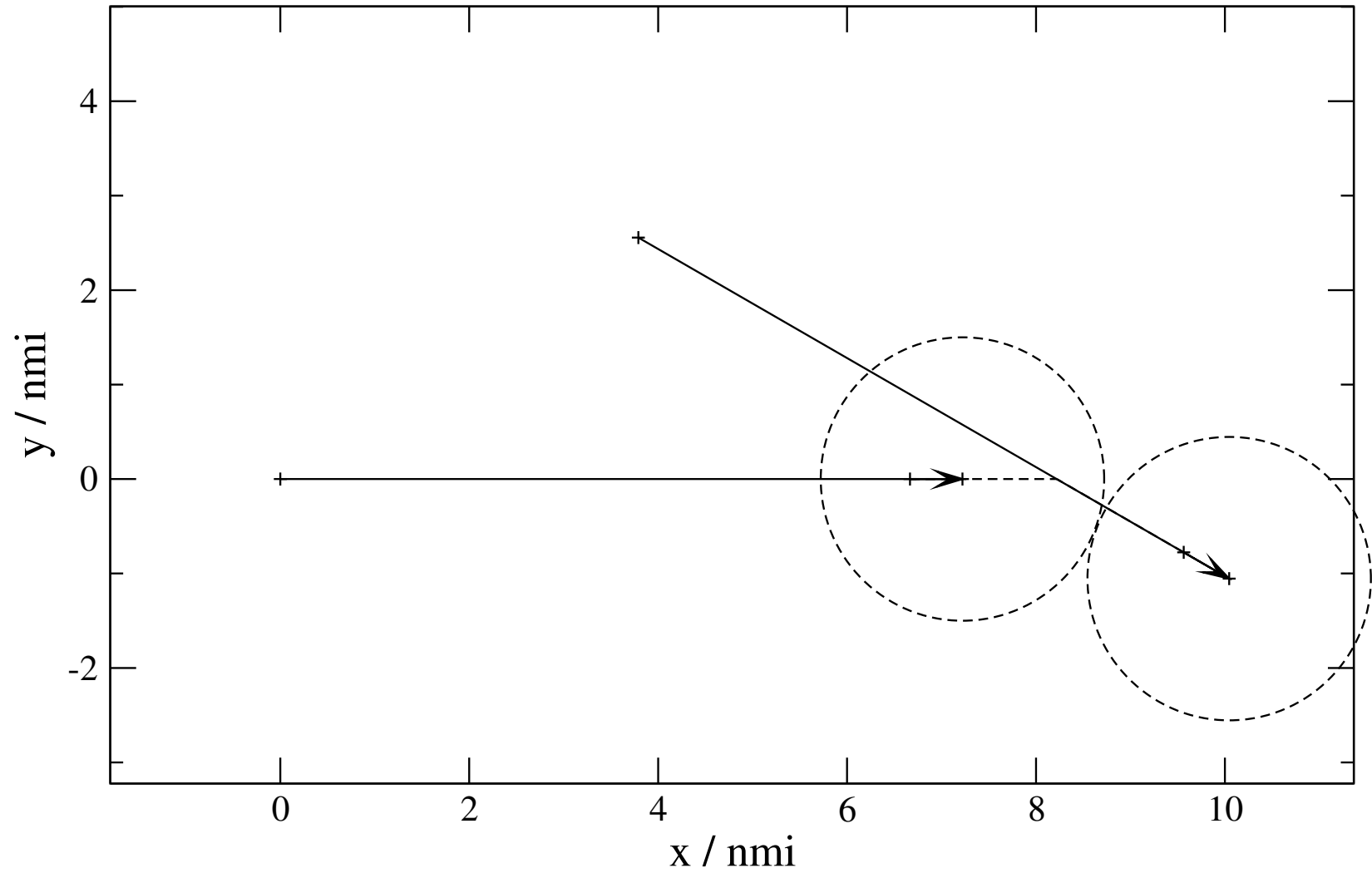
Constant-Velocity Encounter Planview

time: +8.0 sec, angle: 30 deg, min separation: 3.00 nmi



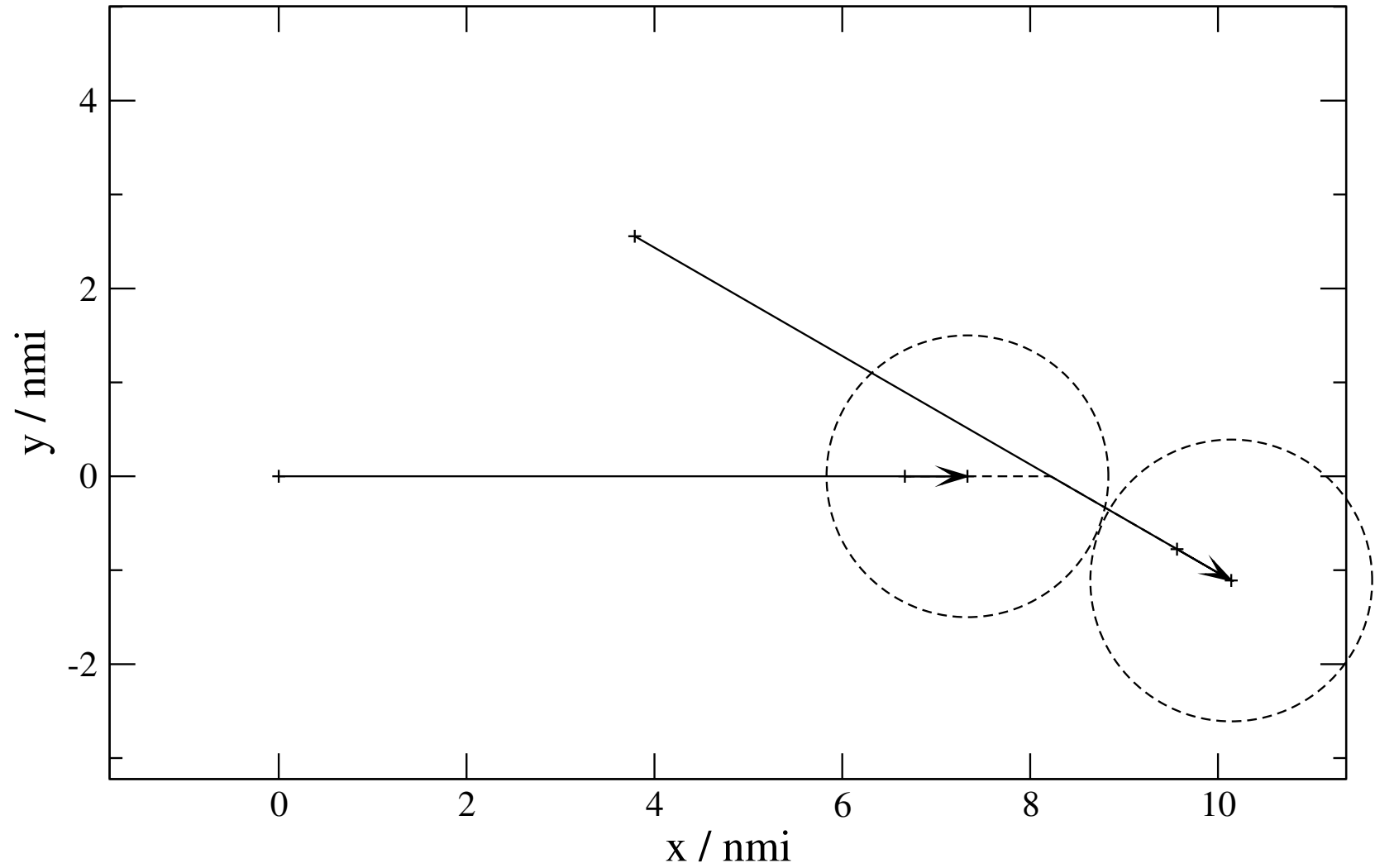
Constant-Velocity Encounter Planview

time: +10.0 sec, angle: 30 deg, min separation: 3.00 nmi



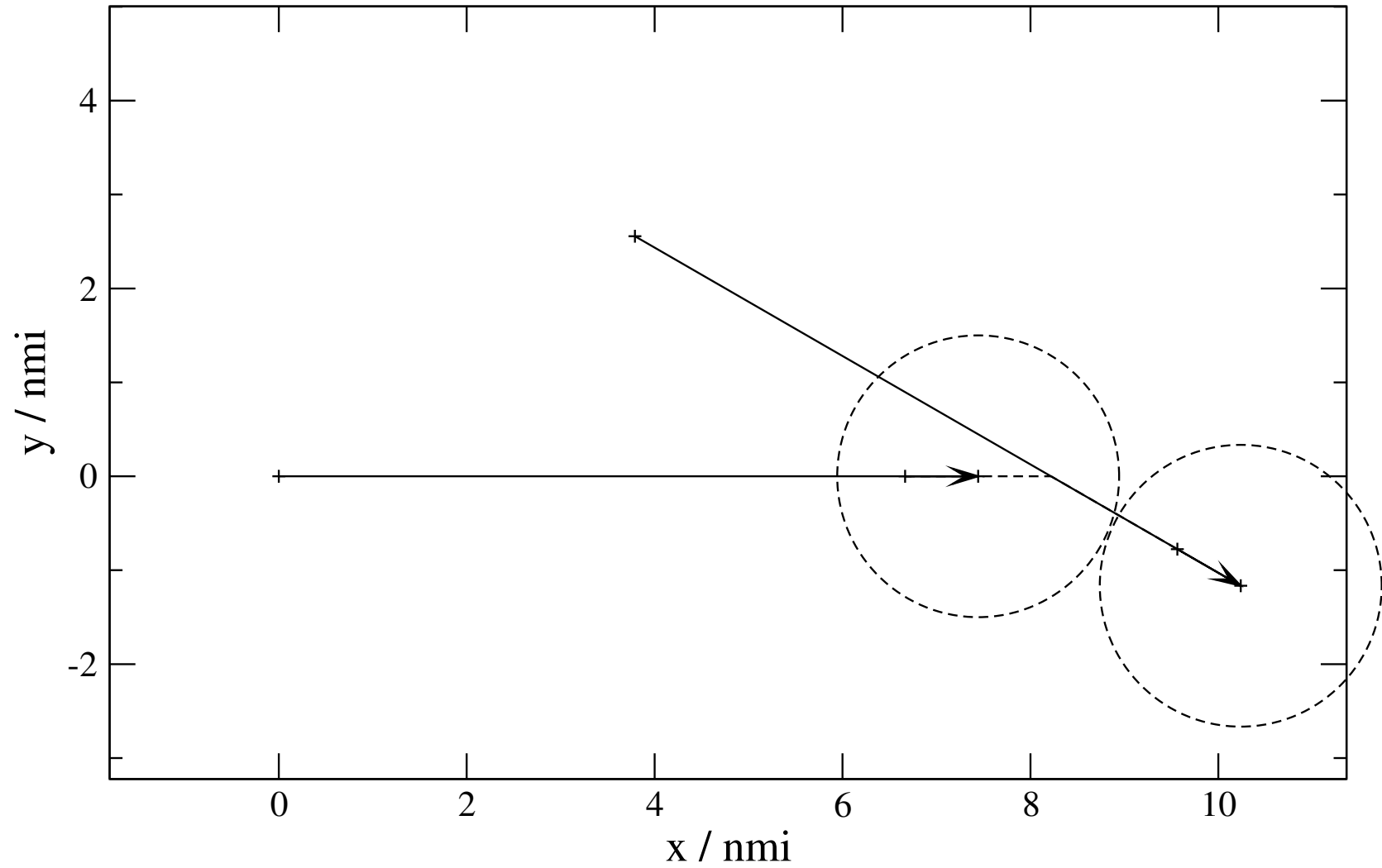
Constant-Velocity Encounter Planview

time: +12.0 sec, angle: 30 deg, min separation: 3.00 nmi



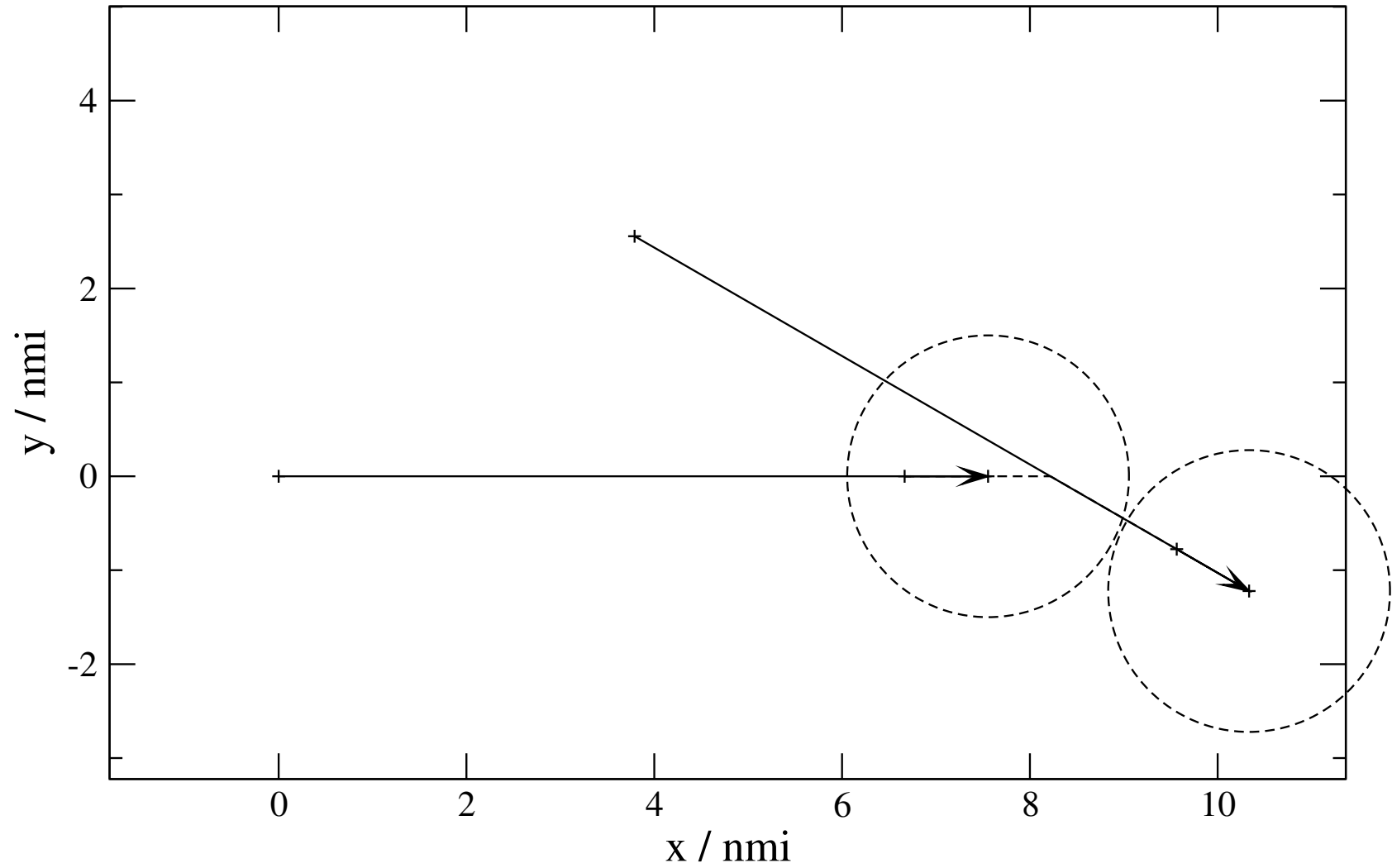
Constant-Velocity Encounter Planview

time: +14.0 sec, angle: 30 deg, min separation: 3.00 nmi



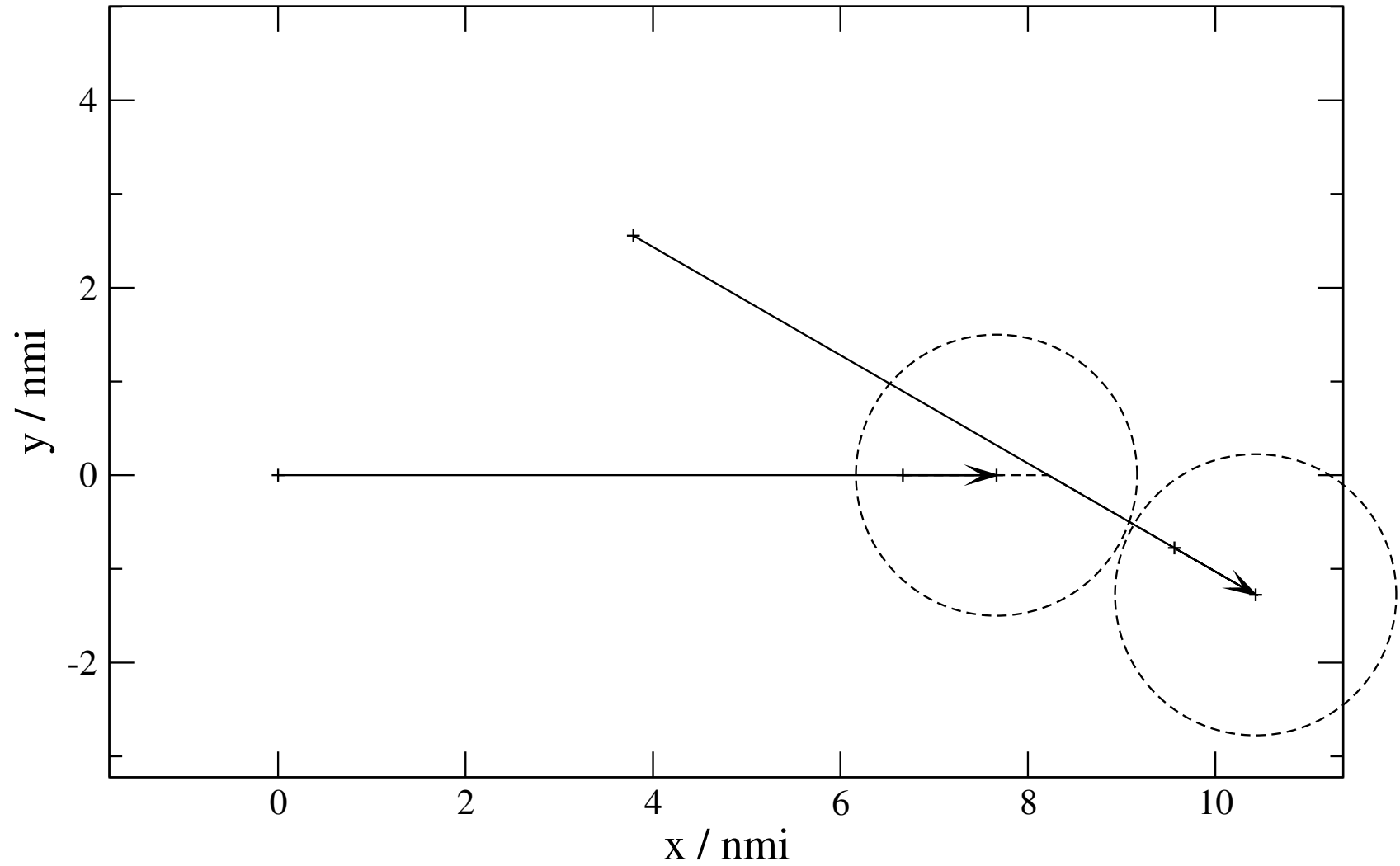
Constant-Velocity Encounter Planview

time: +16.0 sec, angle: 30 deg, min separation: 3.00 nmi



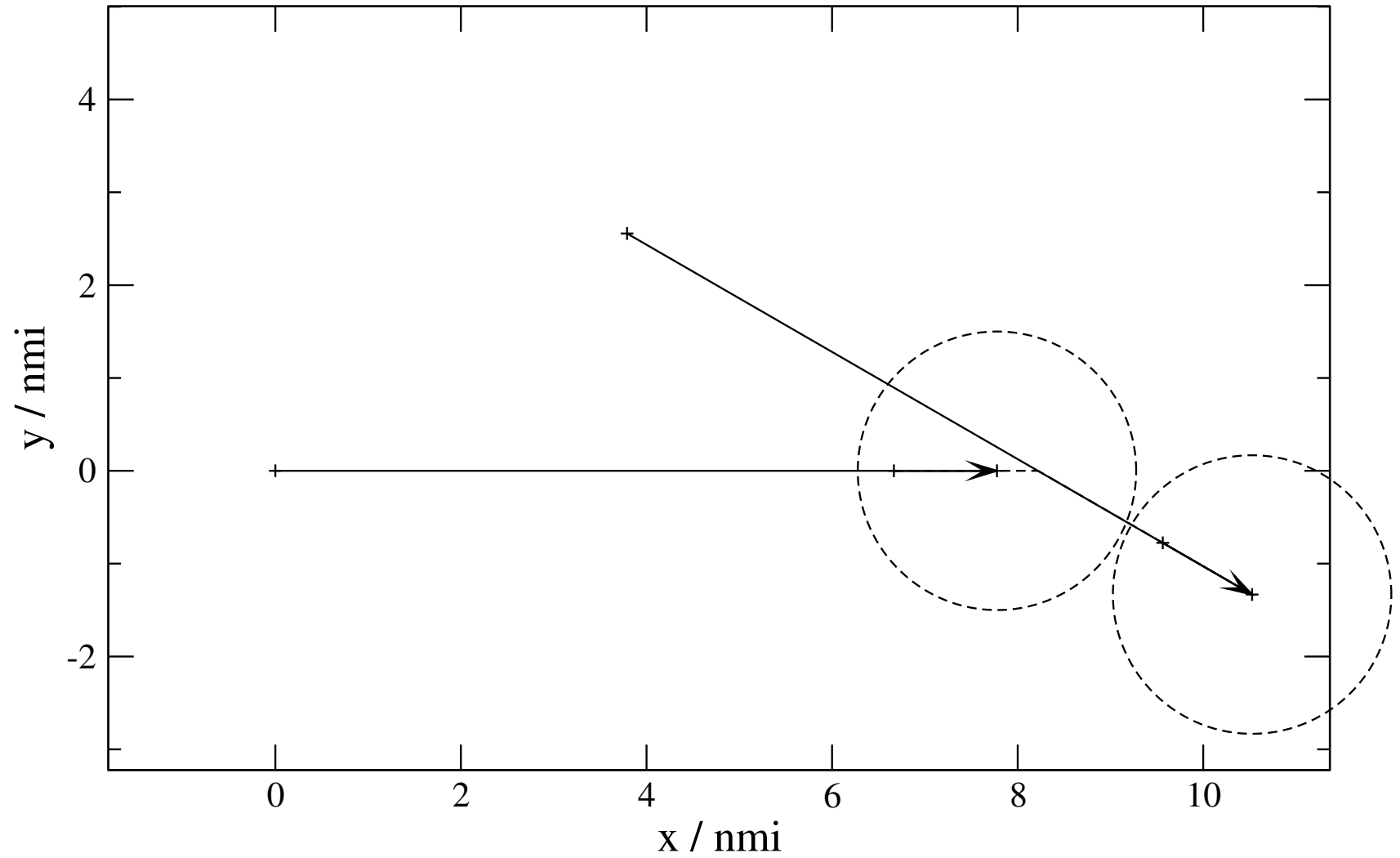
Constant-Velocity Encounter Planview

time: +18.0 sec, angle: 30 deg, min separation: 3.00 nmi



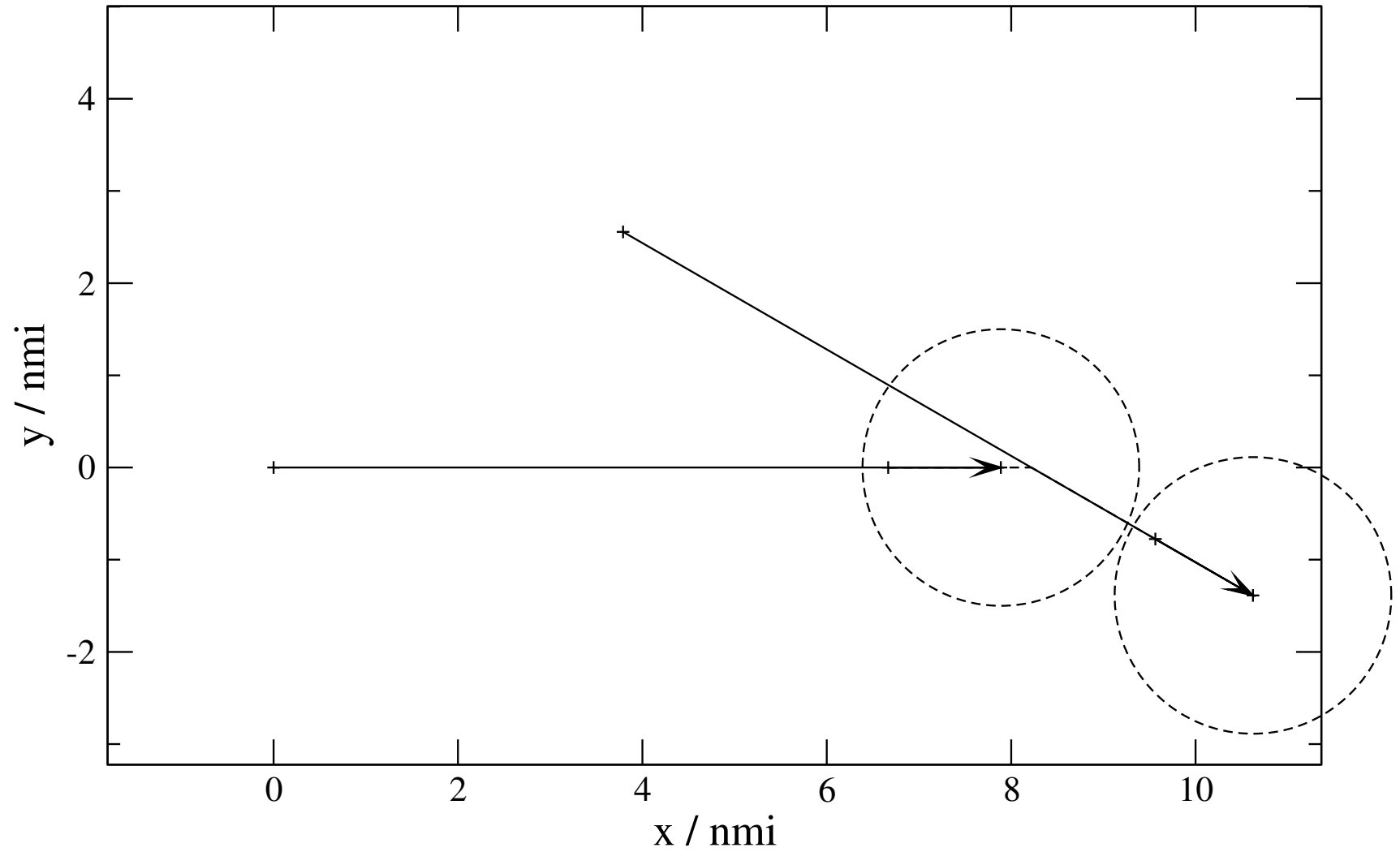
Constant-Velocity Encounter Planview

time: +20.0 sec, angle: 30 deg, min separation: 3.00 nmi



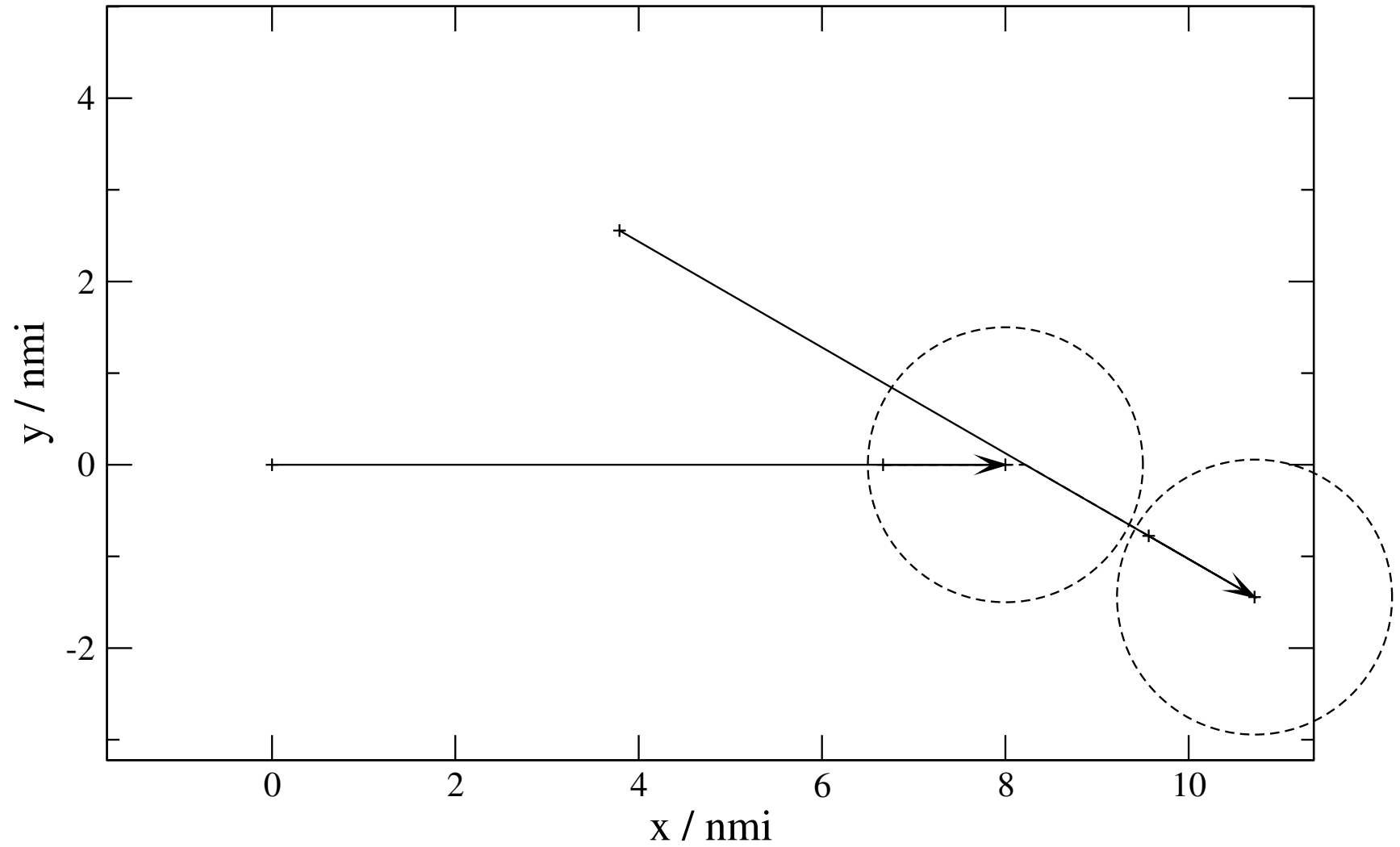
Constant-Velocity Encounter Planview

time: +22.0 sec, angle: 30 deg, min separation: 3.00 nmi



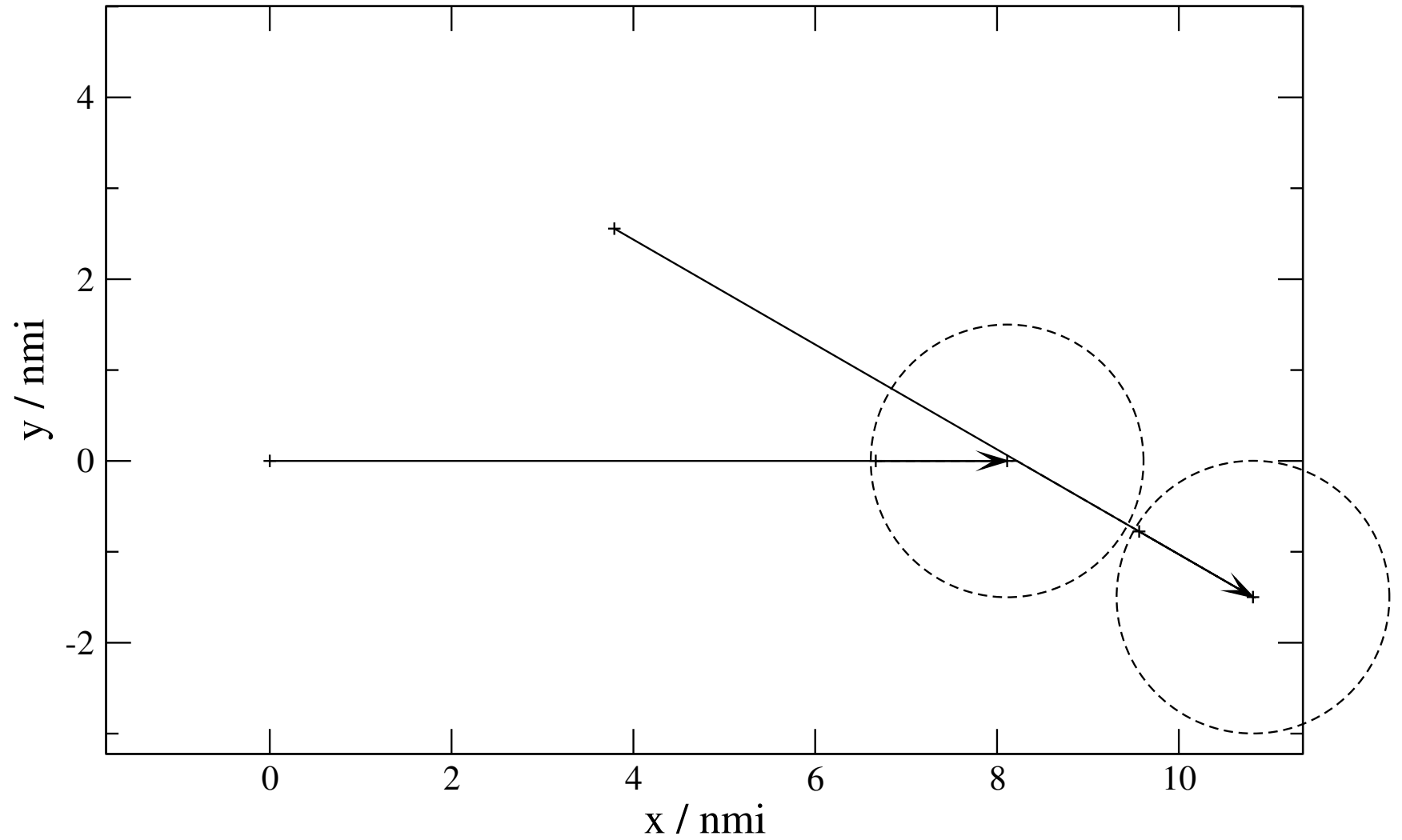
Constant-Velocity Encounter Planview

time: +24.0 sec, angle: 30 deg, min separation: 3.00 nmi



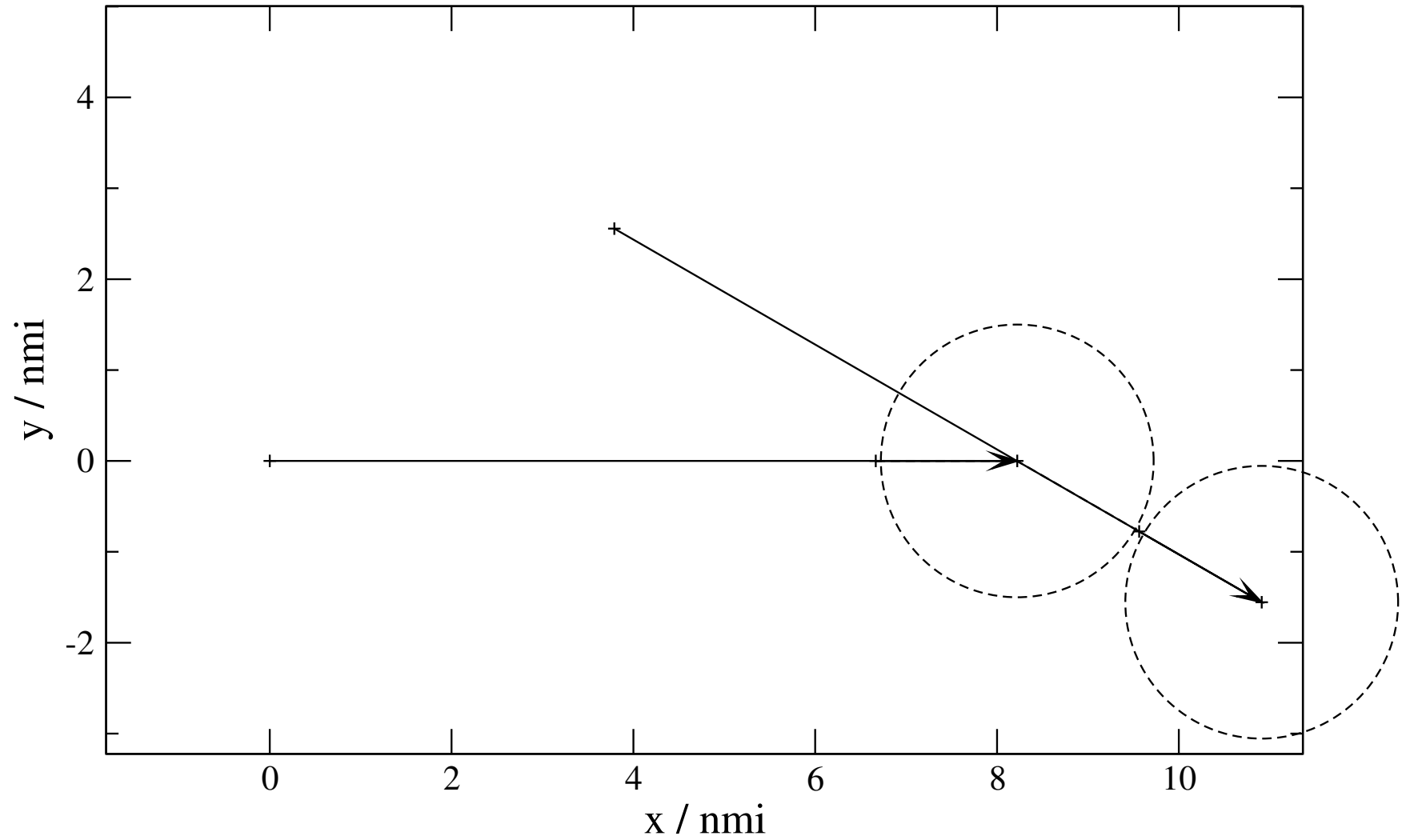
Constant-Velocity Encounter Planview

time: +26.0 sec, angle: 30 deg, min separation: 3.00 nmi



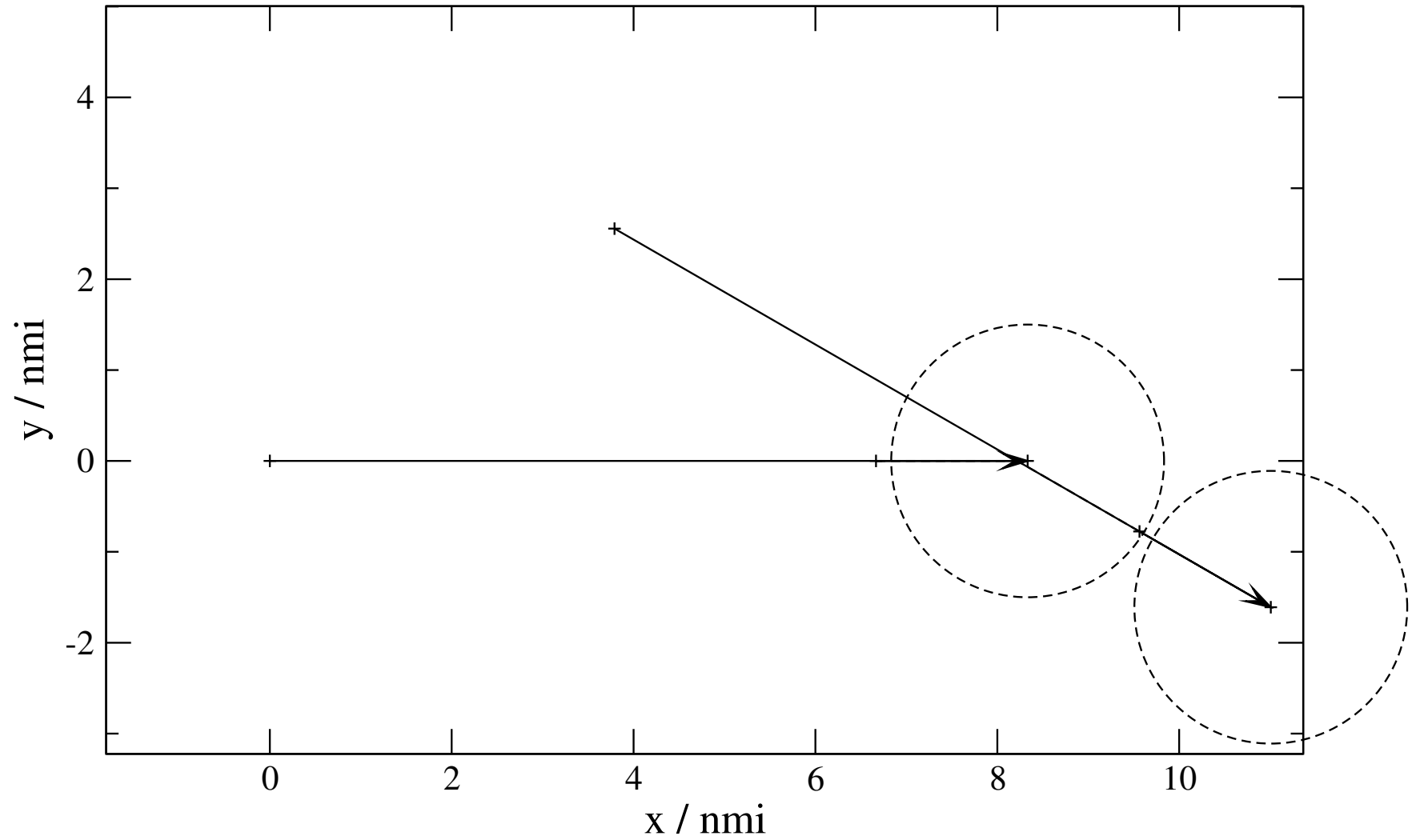
Constant-Velocity Encounter Planview

time: +28.0 sec, angle: 30 deg, min separation: 3.00 nmi



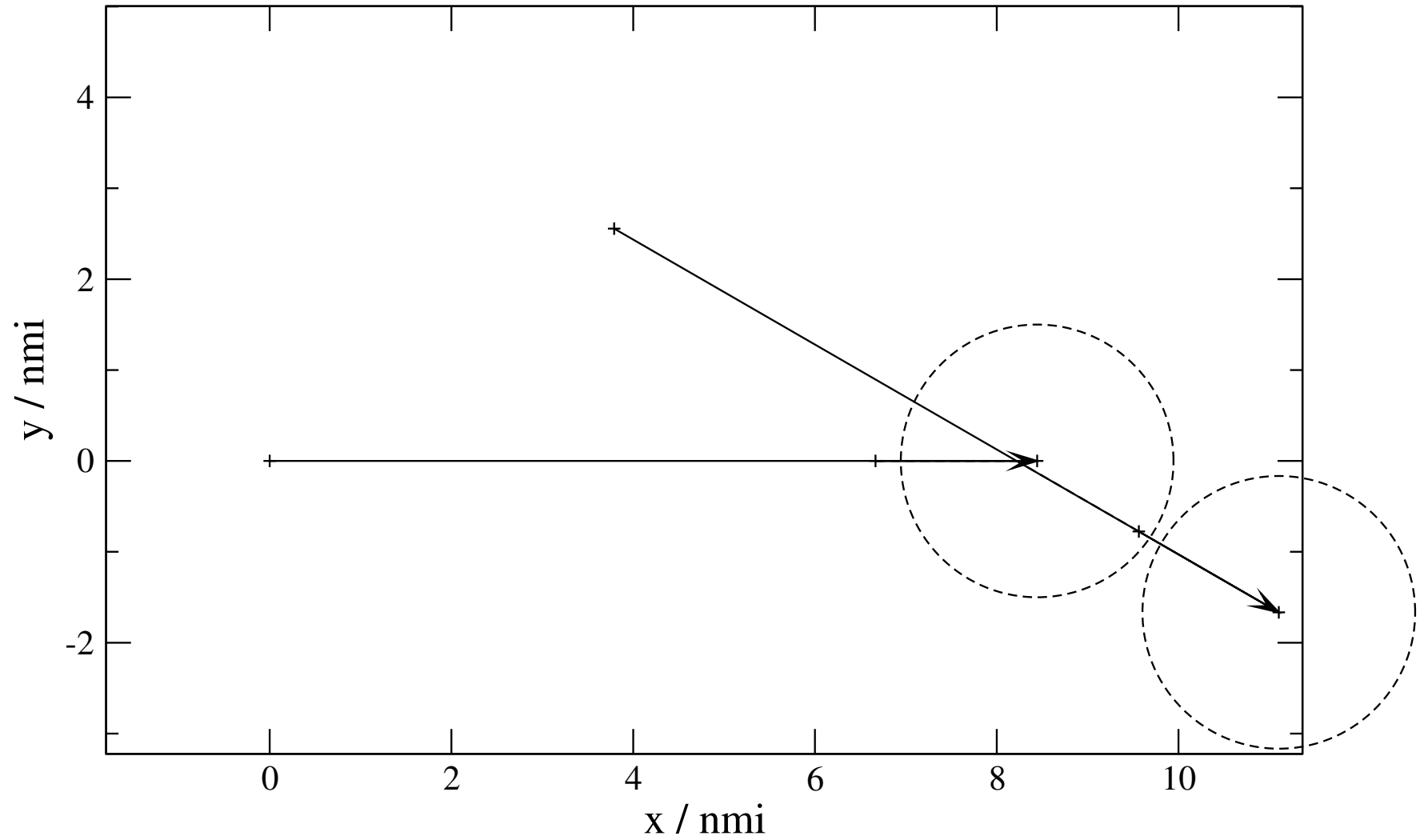
Constant-Velocity Encounter Planview

time: +30.0 sec, angle: 30 deg, min separation: 3.00 nmi



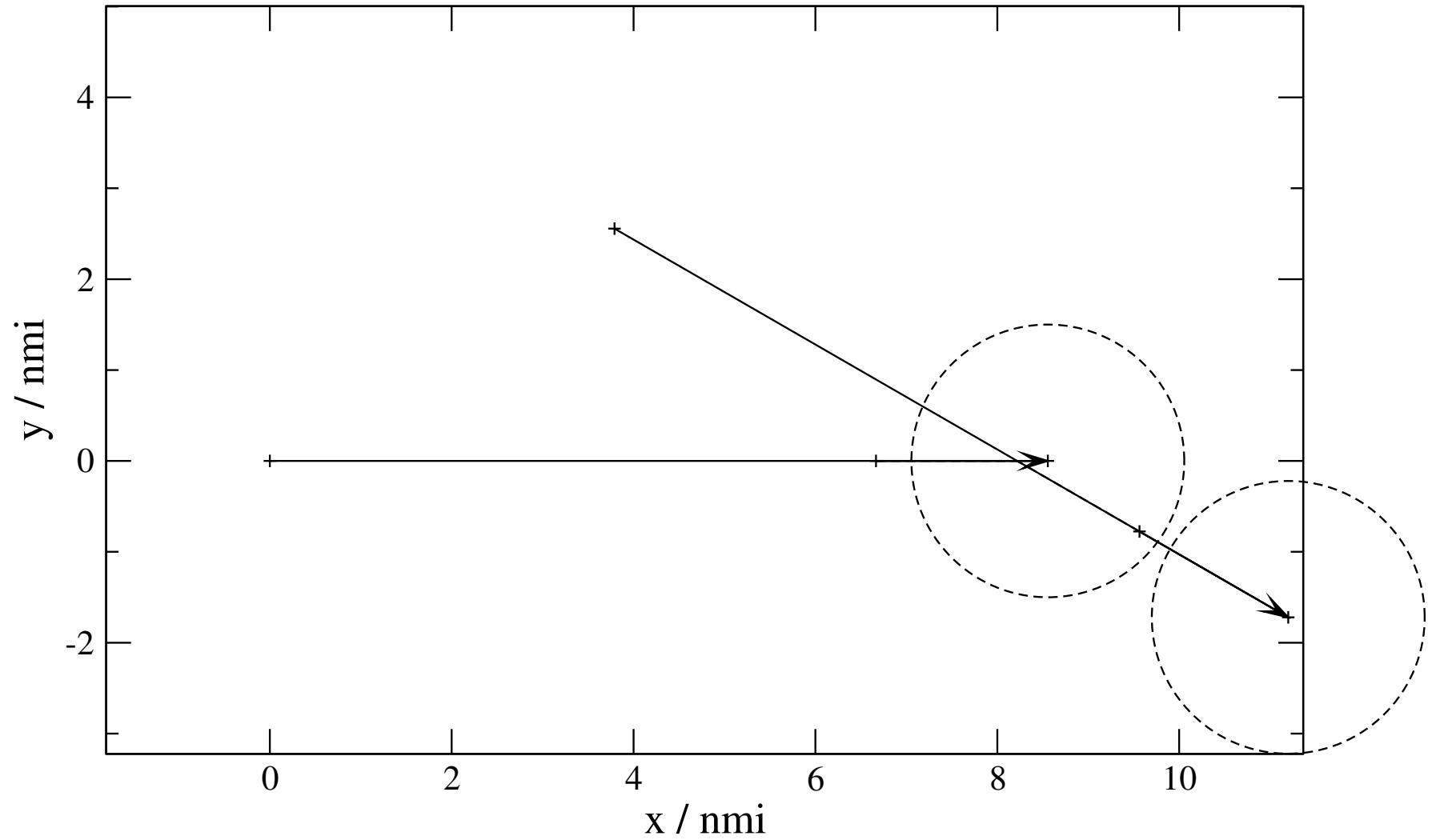
Constant-Velocity Encounter Planview

time: +32.0 sec, angle: 30 deg, min separation: 3.00 nmi



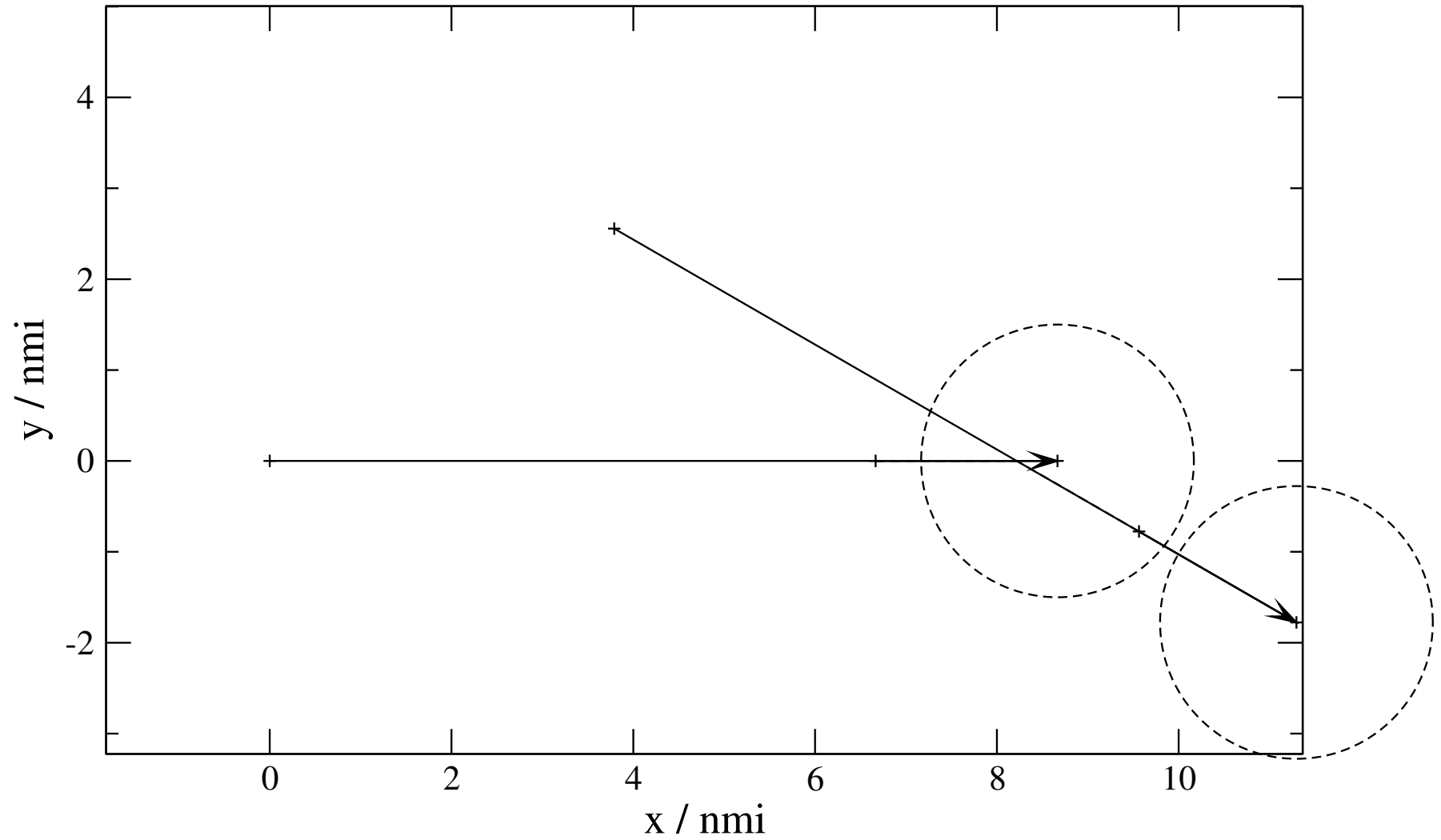
Constant-Velocity Encounter Planview

time: +34.0 sec, angle: 30 deg, min separation: 3.00 nmi



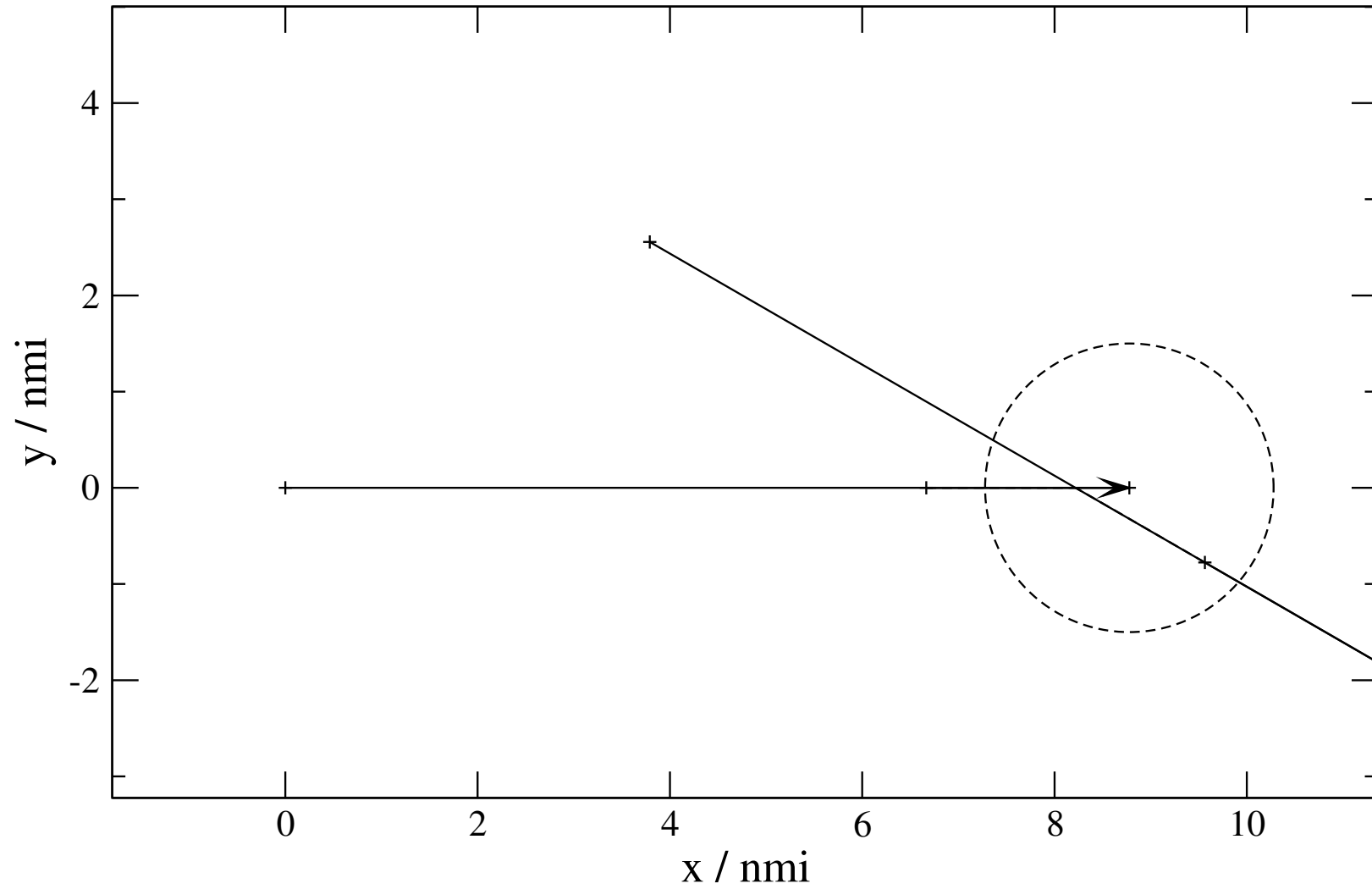
Constant-Velocity Encounter Planview

time: +36.0 sec, angle: 30 deg, min separation: 3.00 nmi



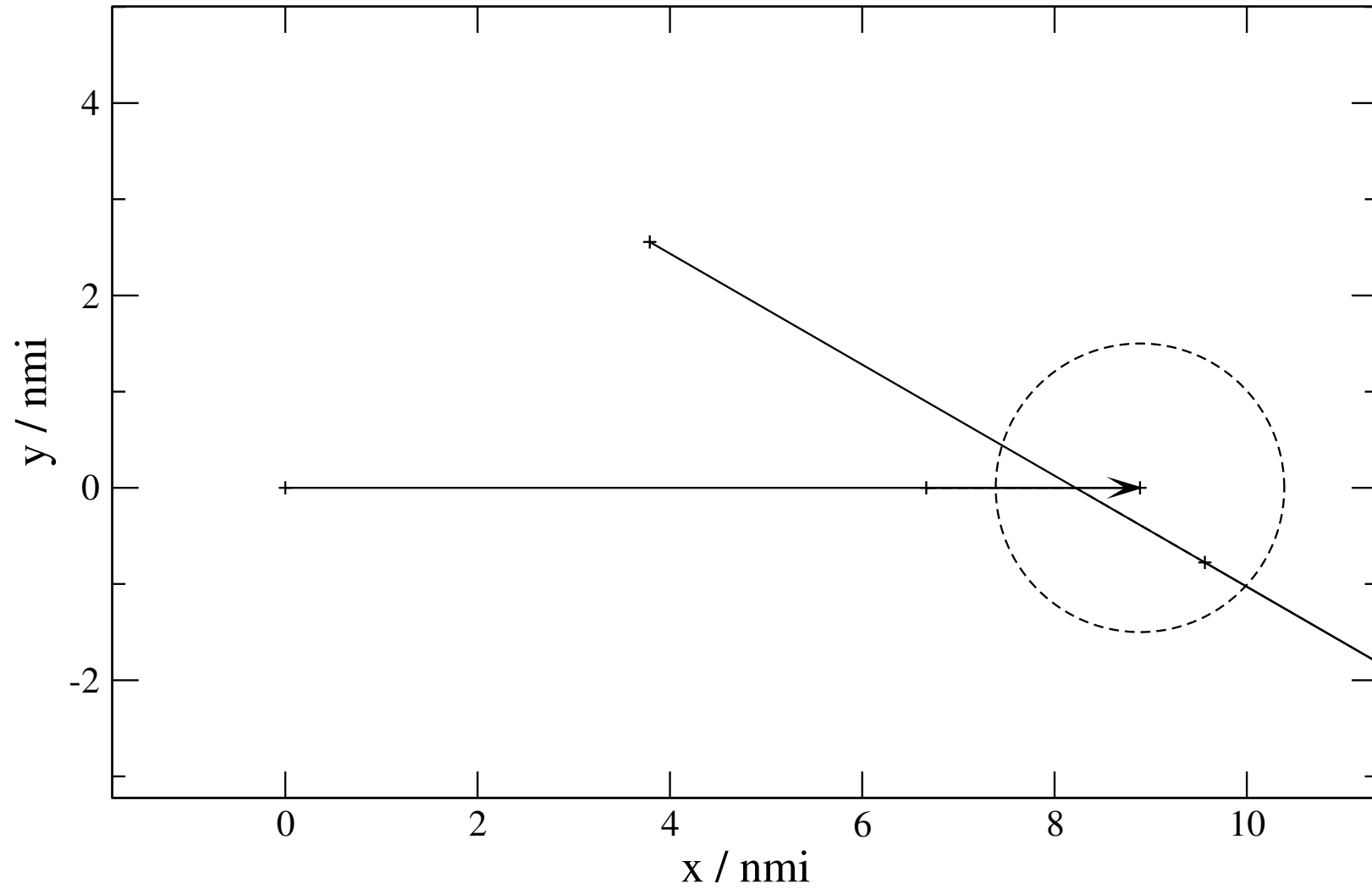
Constant-Velocity Encounter Planview

time: +38.0 sec, angle: 30 deg, min separation: 3.00 nmi



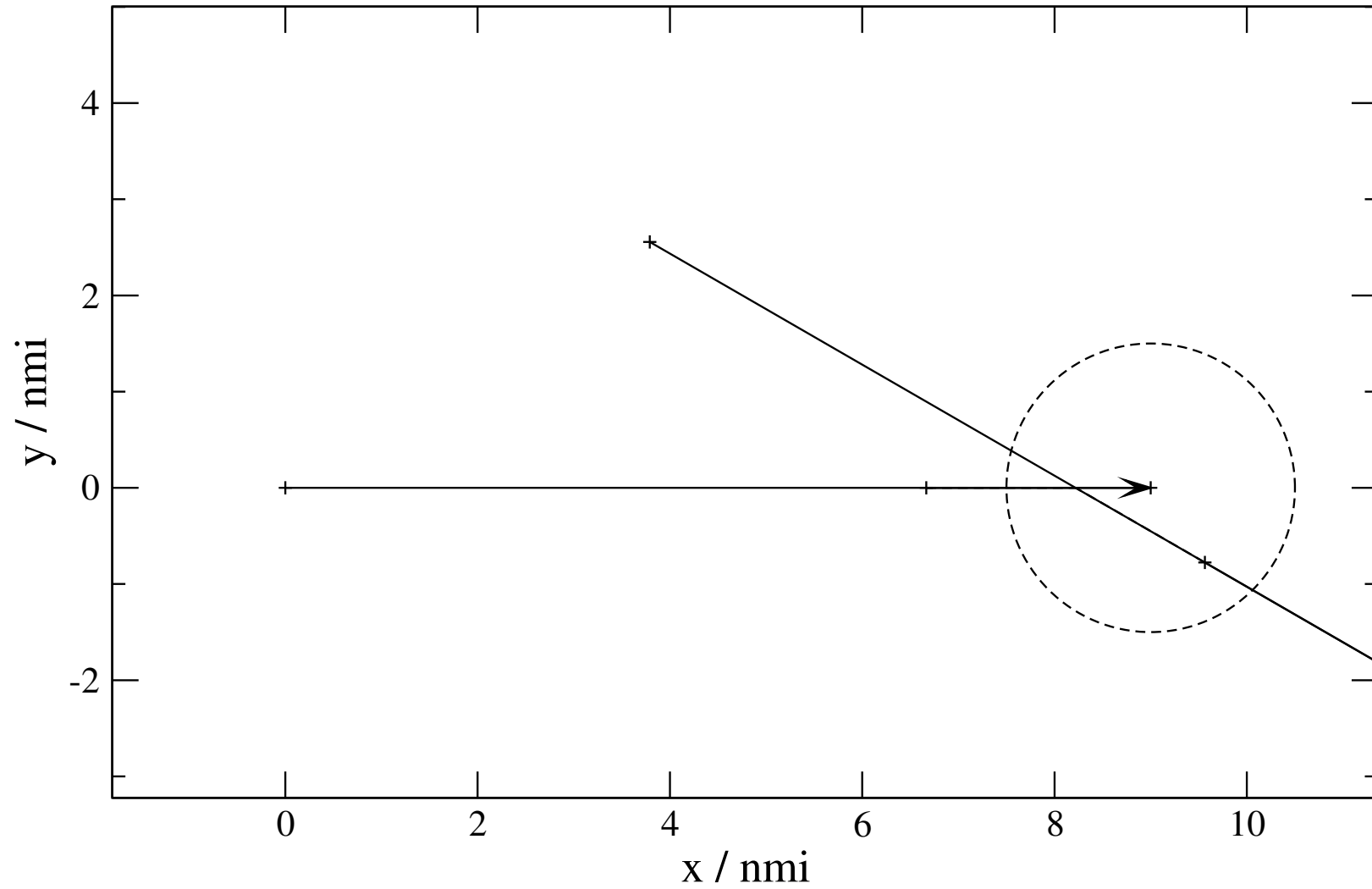
Constant-Velocity Encounter Planview

time: +40.0 sec, angle: 30 deg, min separation: 3.00 nmi



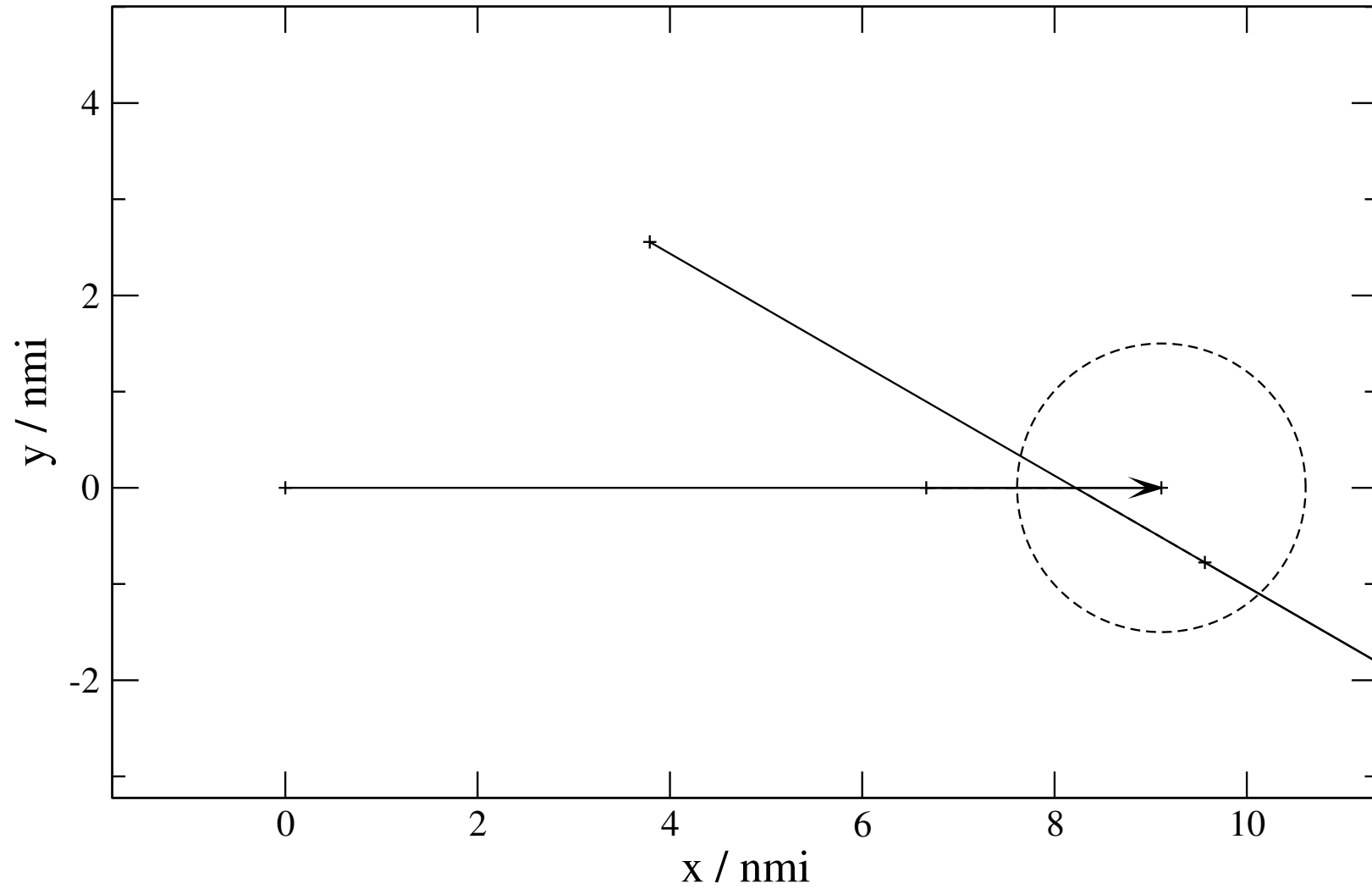
Constant-Velocity Encounter Planview

time: +42.0 sec, angle: 30 deg, min separation: 3.00 nmi



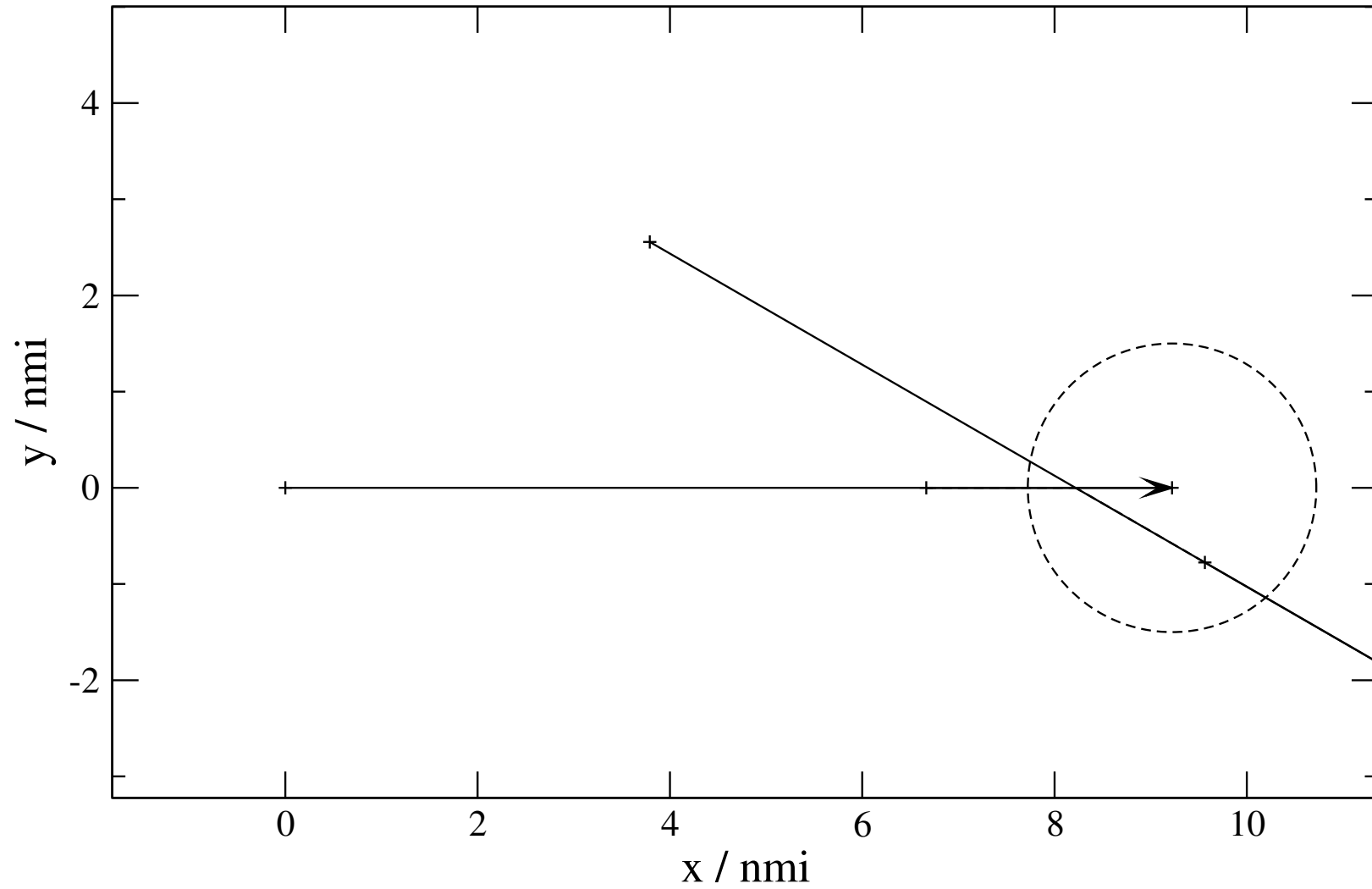
Constant-Velocity Encounter Planview

time: +44.0 sec, angle: 30 deg, min separation: 3.00 nmi



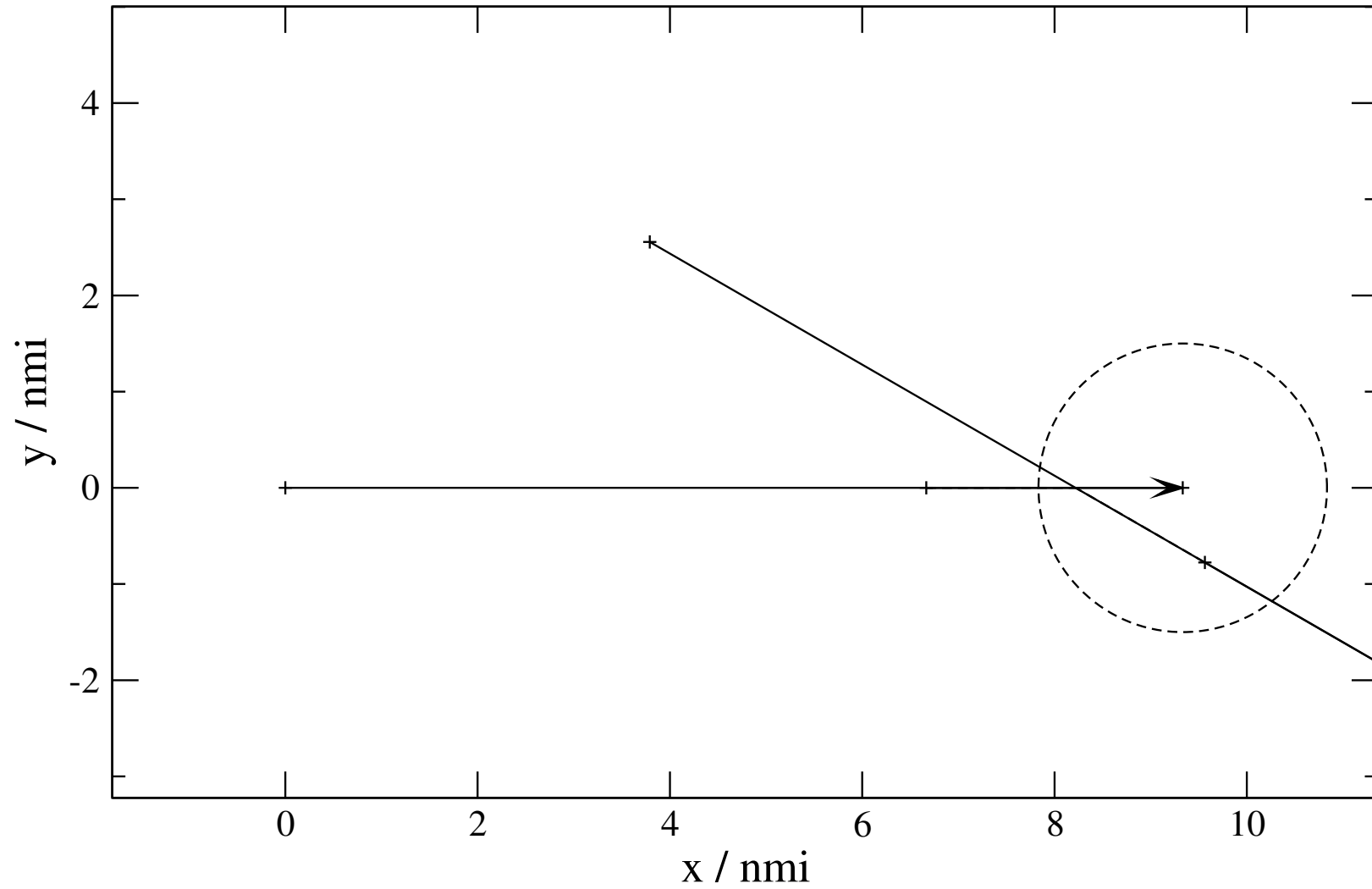
Constant-Velocity Encounter Planview

time: +46.0 sec, angle: 30 deg, min separation: 3.00 nmi



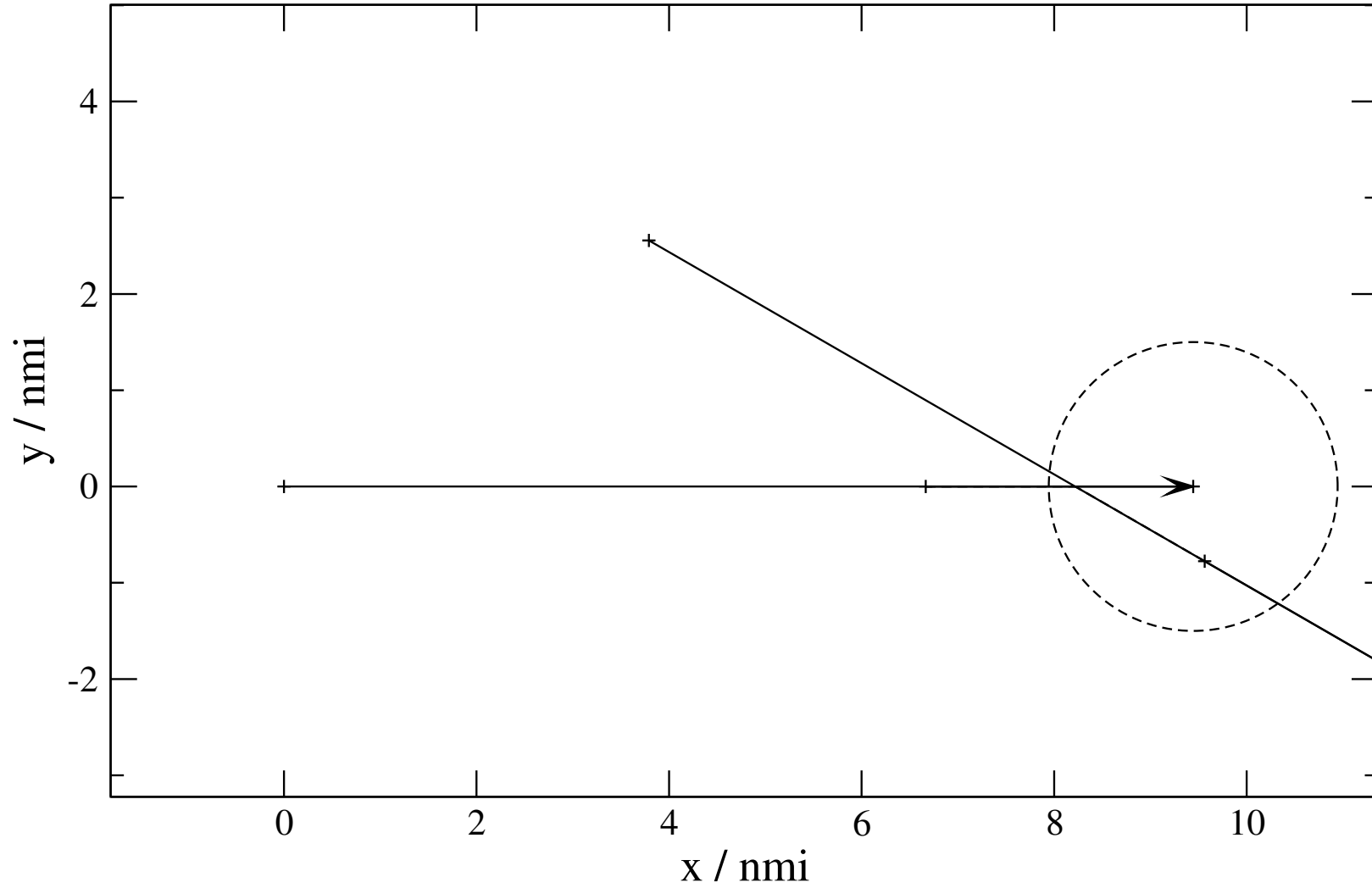
Constant-Velocity Encounter Planview

time: +48.0 sec, angle: 30 deg, min separation: 3.00 nmi



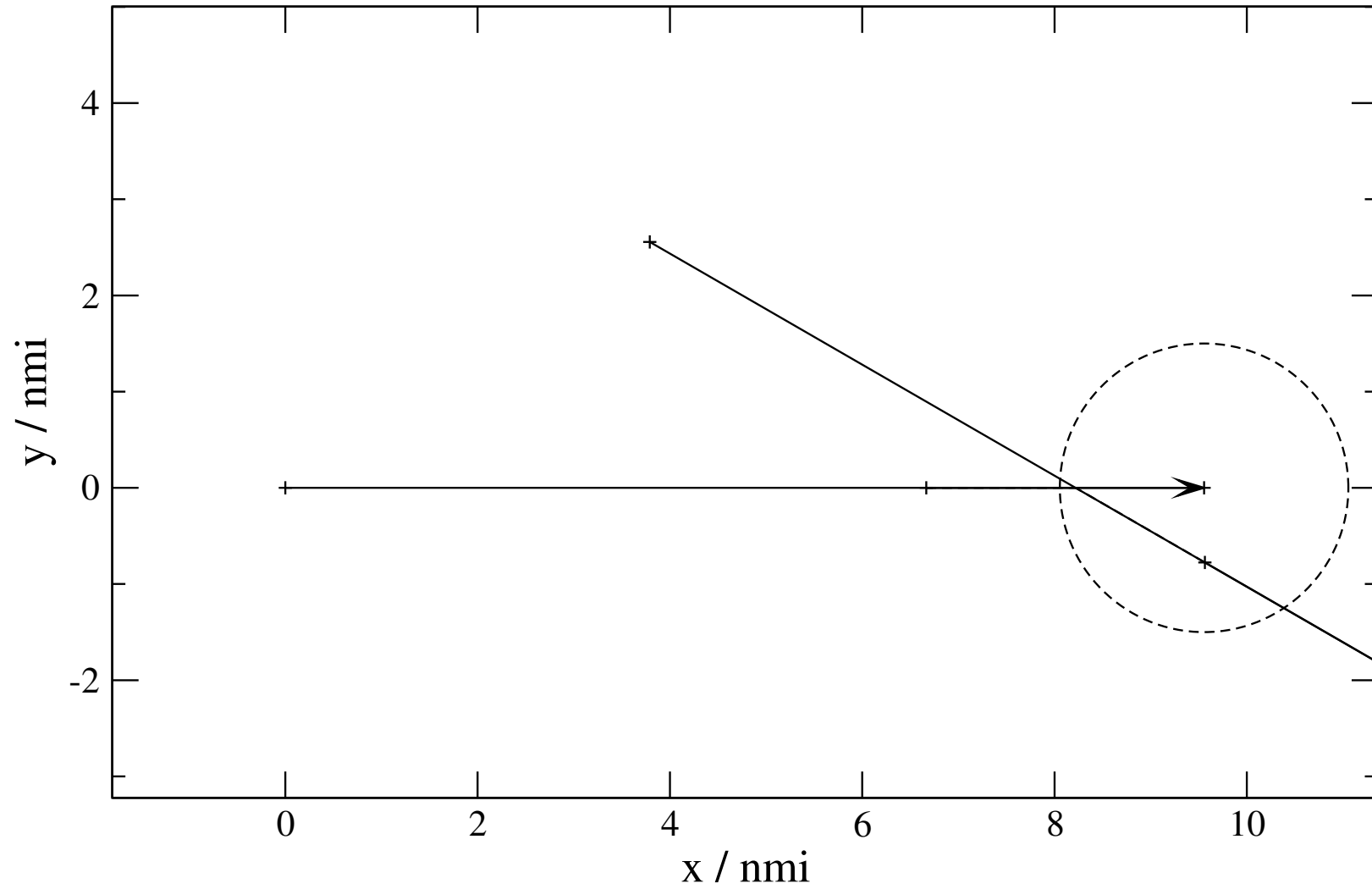
Constant-Velocity Encounter Planview

time: +50.0 sec, angle: 30 deg, min separation: 3.00 nmi



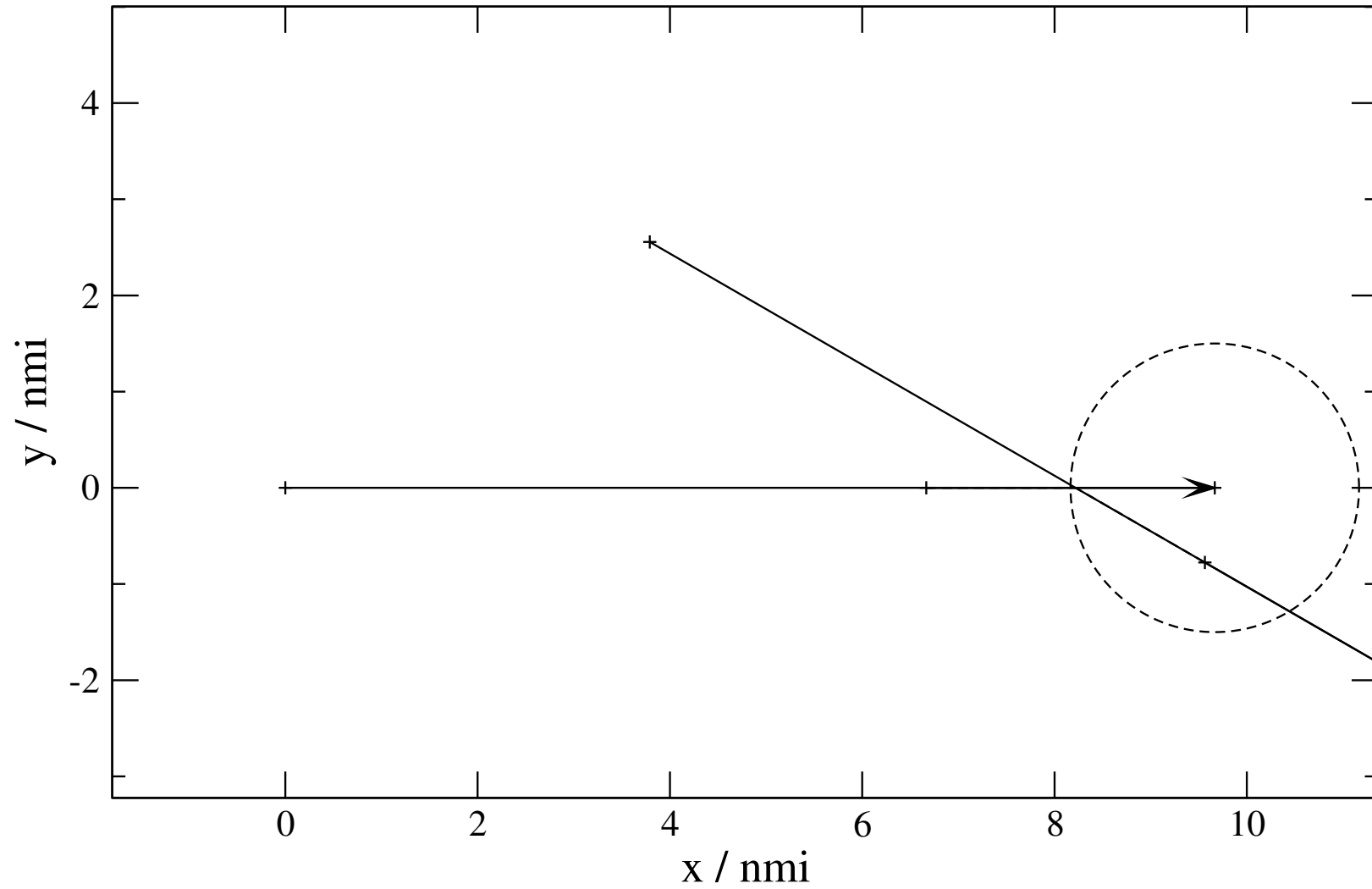
Constant-Velocity Encounter Planview

time: +52.0 sec, angle: 30 deg, min separation: 3.00 nmi



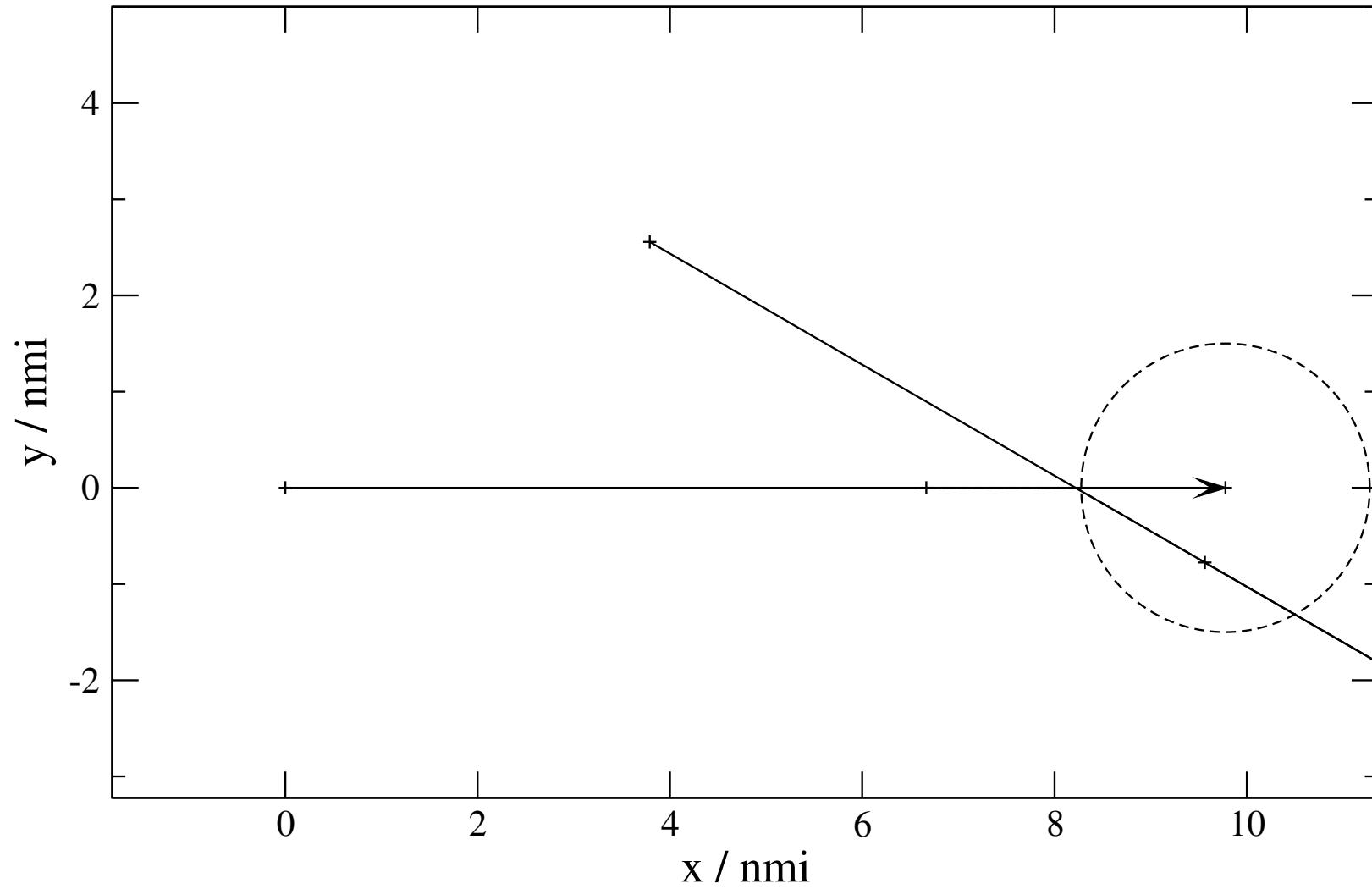
Constant-Velocity Encounter Planview

time: +54.0 sec, angle: 30 deg, min separation: 3.00 nmi



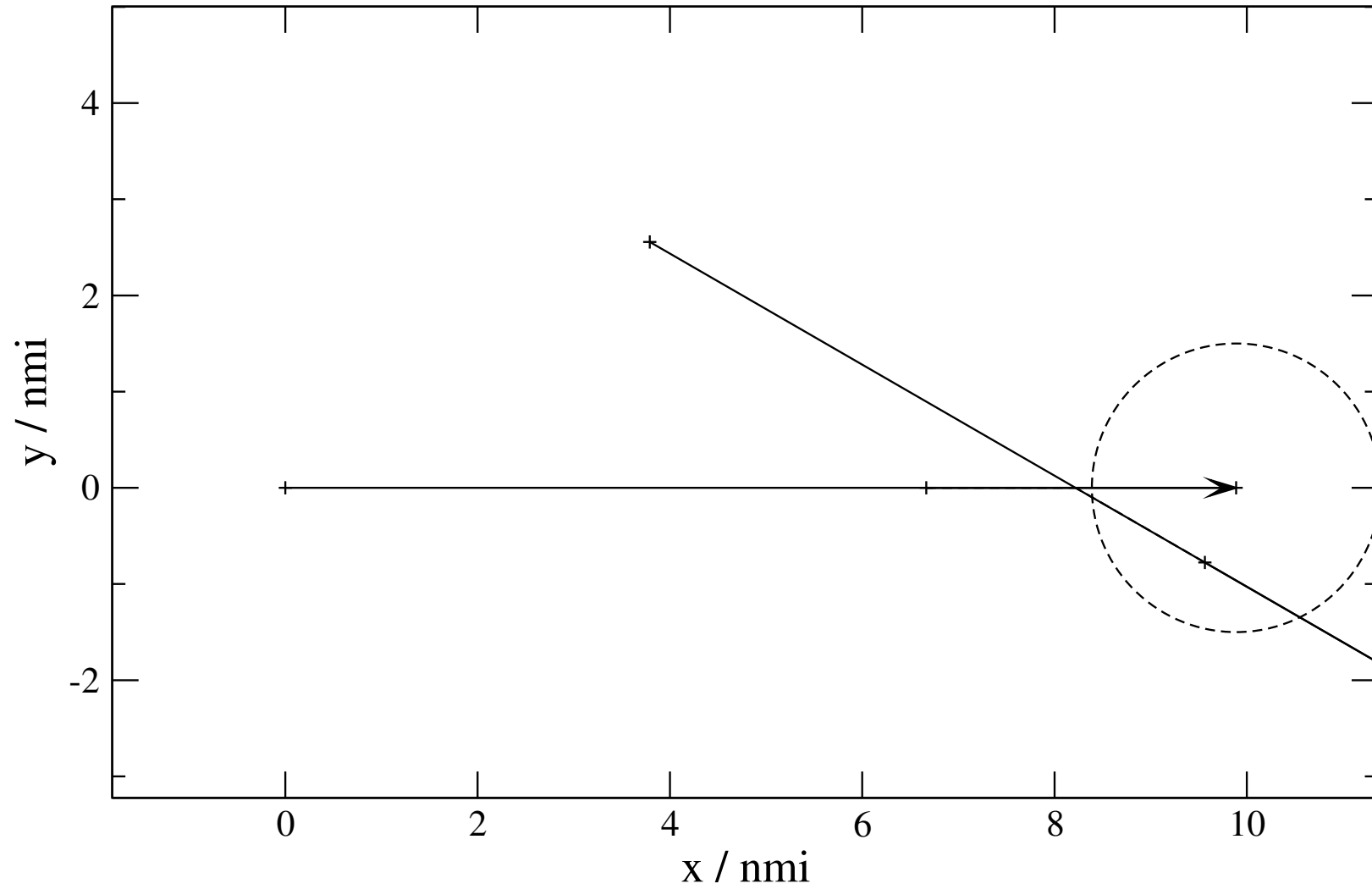
Constant-Velocity Encounter Planview

time: +56.0 sec, angle: 30 deg, min separation: 3.00 nmi



Constant-Velocity Encounter Planview

time: +58.0 sec, angle: 30 deg, min separation: 3.00 nmi



Constant-Velocity Encounter Planview

time: +60.0 sec, angle: 30 deg, min separation: 3.00 nmi

