# Questions on Refining Theories for Projectile

Spencer Smith

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## 1 Context Theories

CT:realArith

CT:functions

CT:nDimSpace(n)

CT:trigonometry

CT:vectors

CT:CartCoordSyst

CT:Differentiation

CT:Integration

## 2 Proposed Sketch of New Approach

Does the following informal idea of what we want to do make sense? If not, how do we change it? Once we have a reasonable sequence of theory refinements, how do we write it down in a rigorous/formal way?

- P = a theory of a position function in 1D space. Given a time, return the position. Build using the context theories of CT:nDimSpace(1), CT:functions.
- V = refine P by differentiating with respect to time. Uses context theories from P and adds CT:Differentiation.
- A = refine V by differentiating with respect to time. Uses context theories of V.
- GD:rectVel = refine A by integration using A:timeStartZero and A:constAccel. $v(t) = v^i + a^c t$. Adds CT:Integration.
- GD:rectPos = refine V by integration using A:timeStartZero and A:constAccel. $p(t) = p^i + v^i t + a^c t^2/2$. Adds context theory CT:realArith, CT:Integration.

- GD:velVec = refine GD:rectVel using CT:nDimSpace(2), CT:CartCoordSyst, CT:vectors and the independence of two coordinate directions. The result is a 2D vector using the equation from GD:rectVel twice with a different initial velocity and constant acceleration in each direction.
- PT:posVecInitMagAndAngle = refine GD:velVec using the angle and magnitude representation of the initial velocity vector, rather than the component-wise representation. Uses CT:trigonometry.
- PT:velVecPlanetaryGrav = refine PT:posVecInitMagAndAngle using an acceleration of 0 in the $x$ direction and an acceleration of $-g$ in the $y$ direction.