

Quadratic Model

Ethics:

* Engineers using motion models must ensure safety.

* Wrong assumptions could cause unsafe designs.

TOK link: Apply math carries ethical responsibility in real world decisions.

A ball is thrown upward from the ground with an initial velocity of 20 m/s. Its height after t seconds is modeled by

$$h(t) = -5t^2 + 20t$$

At what time does the ball reach its maximum height and what is that height?

Perspectives:

* A physicist values the model for prediction accuracy.

* A mathematician focuses on the structure of the parabola.

* A coach or athlete may care about performance outcomes.

TOK link: Different knowers value the same knowledge for different purposes.

Scope:

* This quadratic model helps explain & predict motion under gravity.

* It assumes no air resistance and constant gravity.

TOK link: Mathematical knowledge is powerful but only within its assumptions.

Methods & Tools

* using the quadratic formula or vertex formula

* Algebraic manipulation

* Graph Interpretation.

TOK link: Mathematics builds knowledge through logical reasoning and symbolic tools.