# CSE 167 Discussion #7.5

## You Got Potential

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# Potentials

- In a closed system, kinetic potential energy and gravitational potential energy sum to 0.
- Let *m* be mass, *v* be velocity, *g* be gravitational acceleration, and *h* be the change in height:
- Cancel out the mass (assume it's 1)

$$\frac{1}{2}v^2 + gh = 0$$

# Potentials

- Solve for *v* and you have the velocity

$$v = \sqrt{-2g\Delta h}$$

# Potential Notes

- *g* may not be -9.8. Play around with the values.
- When we are at the top, *Δh=0*. This means velocity is 0, and our pod will stop!
  →Give a slight nudge
- How do we use this v?

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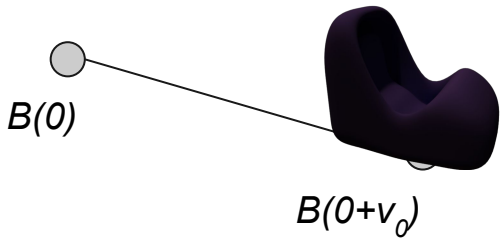
- Once we have this *v*, how do we find the next point our pod should move to?
- This *v* is technically in world space, but let's make the simplifying assumption (it looks good enough!) that it's in the bezier curve space (i.e. We'll add it to *t*)

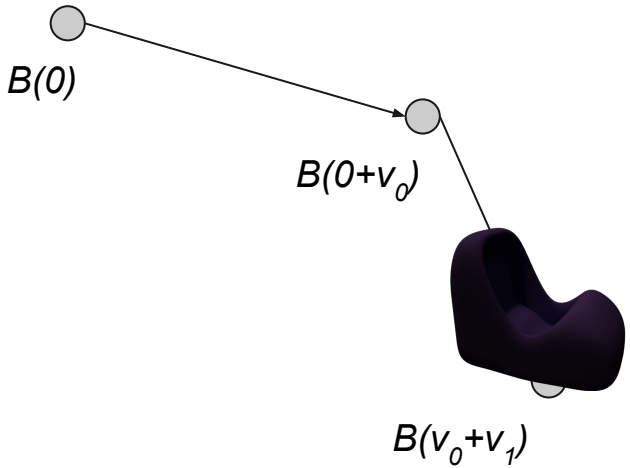
# Wheeeee!

Let *B(t)* be the point along the bezier curve *B* at *t*.
Our roller coaster starts at *B(0)*
If our velocity from that point is $v_0$ we'll move to $B(0+v_0)$



# Wheeeee!

We'll continue calculating our $v_0$ for the next frame
This let's us continue traversing the curve



# Wheeeee!

You get the idea!
If you ever pass $t > 1.0$, move on to the next curve, rinse and repeat