

Travels with Euler

“An assortment of predicaments”



George the 1st



George the 2nd



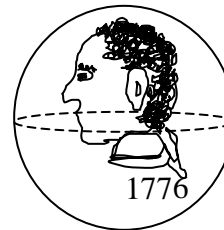
Euler



Euler Jr.



Old Abe



Euler's Sphere

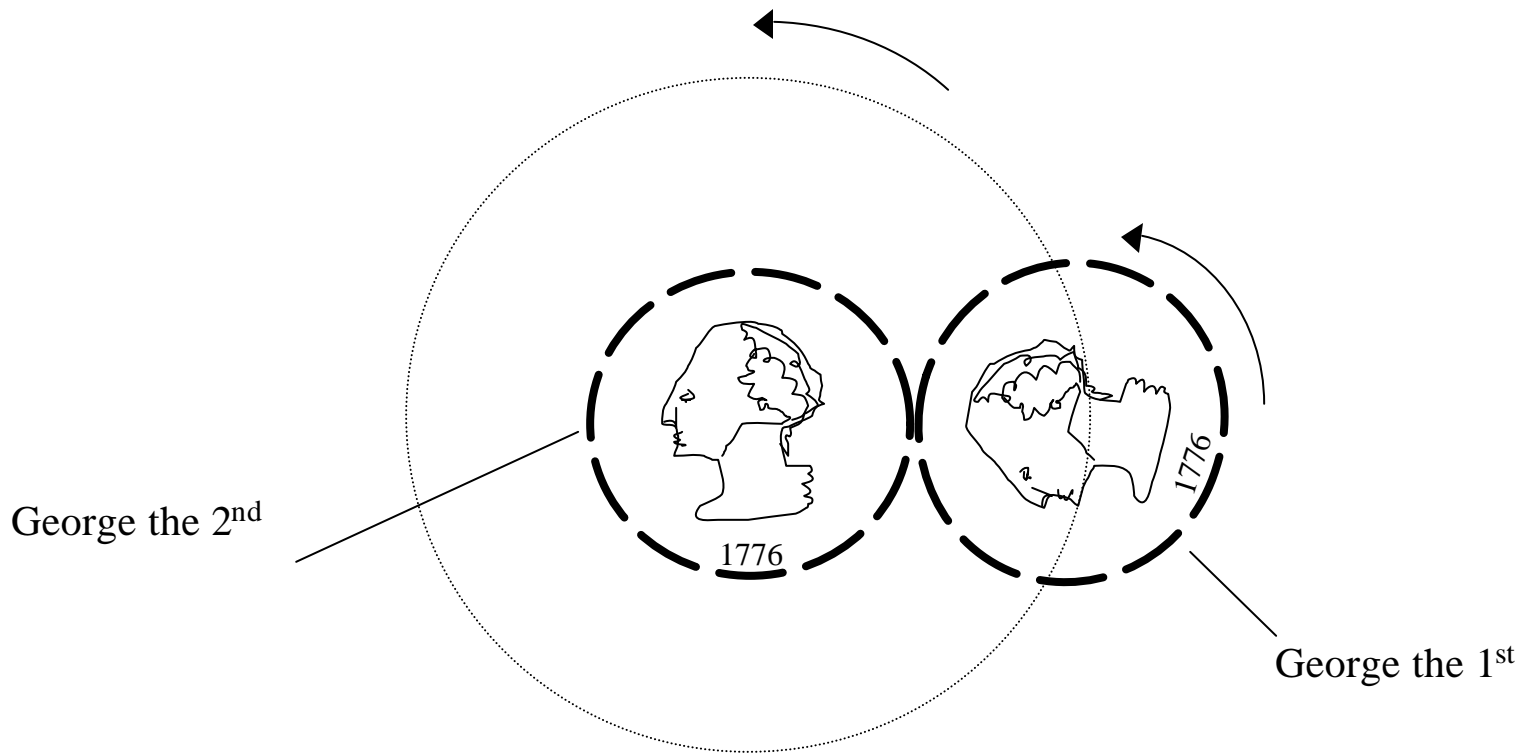
These problems explore vector addition (of angular rates) and apparent rotation

J J Bendik 2003

Rolling Coin Problem I

1970's SAT

How many times does “George the 1st” rotate around after he rolls around “George the 2nd” one time?



Where; the radius of “George the 1st” = radius of “George the 2nd”

Rolling Coin Problem II

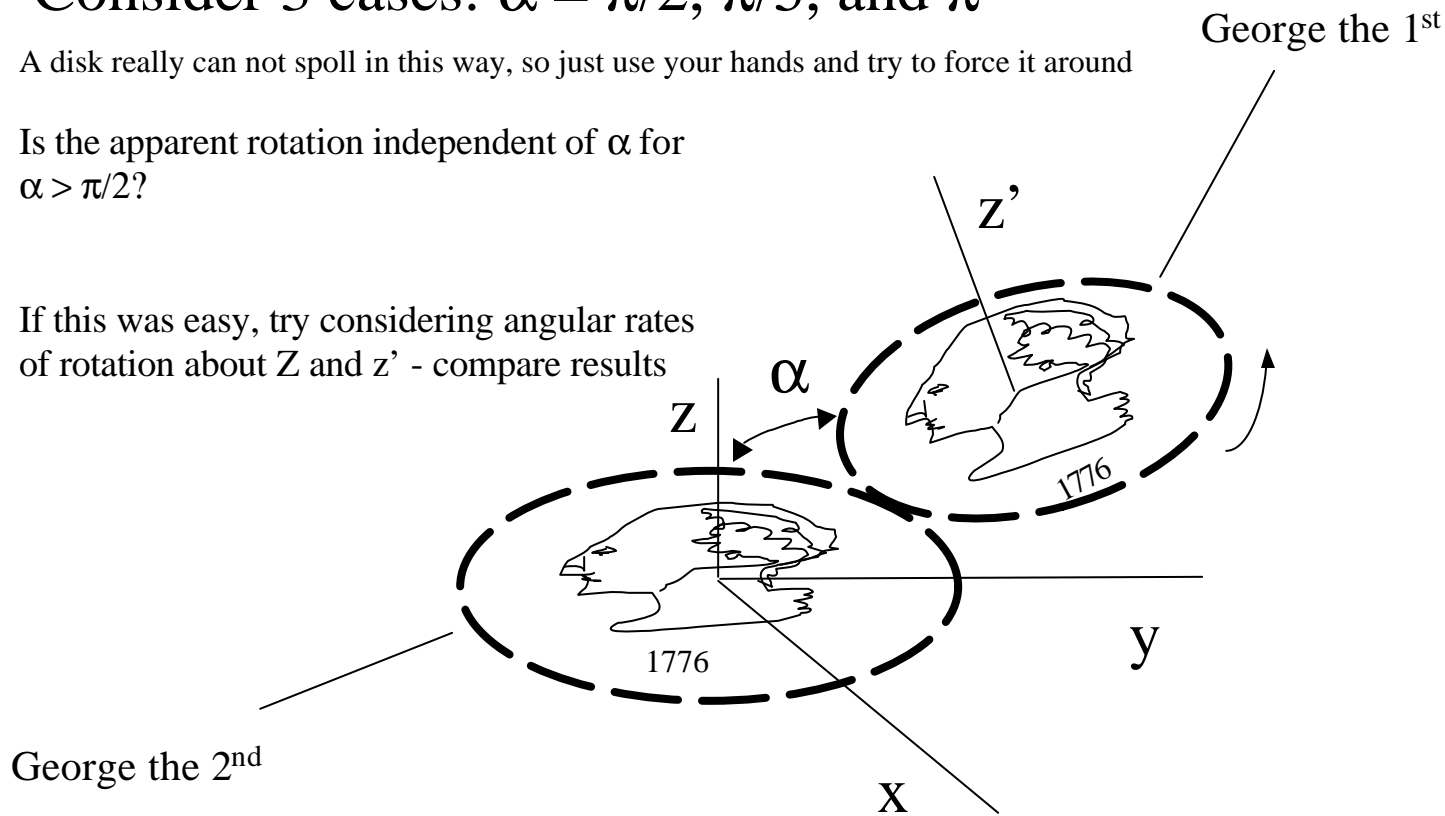
Now, just how many times does “George the 1st” *appear* to rotate around after he rolls around “George the 2nd” one time?
 (The apparent rotation of his head)

Consider 3 cases: $\alpha = \pi/2$, $\pi/3$, and π

A disk really can not spoll in this way, so just use your hands and try to force it around

Is the apparent rotation independent of α for $\alpha > \pi/2$?

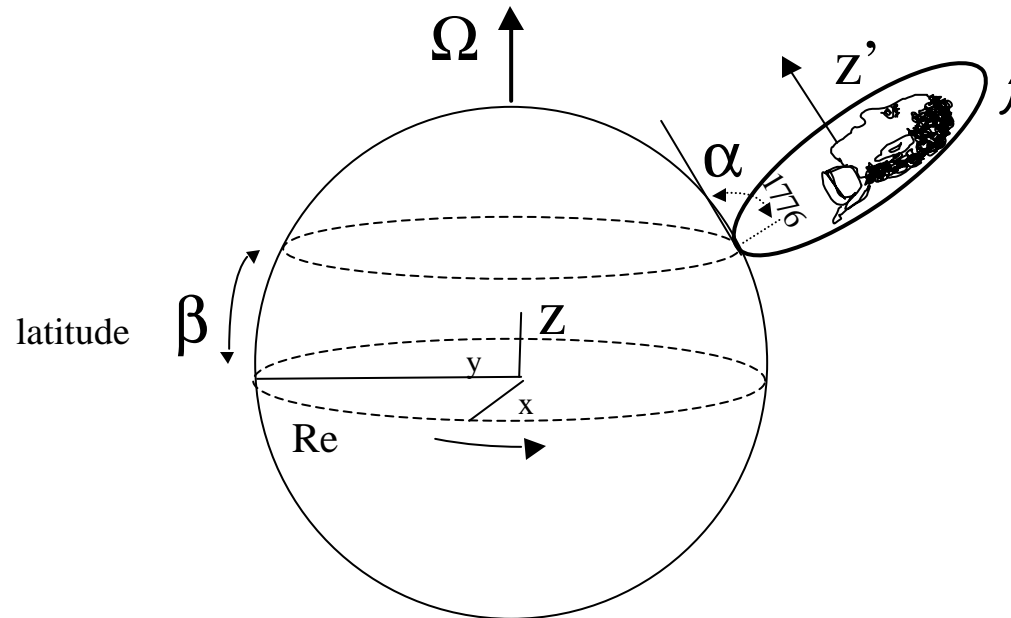
If this was easy, try considering angular rates of rotation about Z and z' - compare results



Where; the radius of “George the 1st”= radius of “George the 2nd”
 and $\pi/2 < \alpha < \pi$ (z' is perpendicular to the face of George the 1st)

Rolling Coin Problem III

Now lets expand our understanding. How many times does “Euler” appear to rotate around after rolling around the earth one time (per year) along the upper parallel - the earth rotates at Ω (rev/yr)



Where; the Earth radius (R_e) $>$ Euler radius (E)

Try a few different angles for α