The Gravitron is a circular carnival ride that is 6.2m in radius and spins at a high rate of speed in order to simulate gravity. What velocity is required to experience an acceleration equal to Earth's gravity (aka 1g)?

If the velocity were 2 times faster, how many g's would the riders feel?

How would the radius need to change to allow the riders to experience 5g's at this new velocity?

Solution:

The centripetal acceleration is:

$$a = \frac{v^2}{r}\ , were\ v - angular\ velocity, r - radius$$

Such as $g = 9.8\ ms^2$,

$v = \sqrt{9.8r}$

$\boldsymbol{v = \sqrt{9.8 * 6.2} = 7.79\ radian/s}$

If the velocity were 2 times faster: $\boldsymbol{a = g * 2^2 = 4g}$

In order to make acceleration 5g the radius must be: $\boldsymbol{R = \frac{5}{4}R_0, R = 7.75\ m}$