

Rotational Physics

Name _____

Concepts:

1) Each quantity in translational (linear) physics has a corresponding quantity in angular physics. For each of the quantity below give both the translational and angular equations.

<u>Quantity</u>	<u>translational</u>	<u>angular</u>
Displacement		
Speed		
Angular acceleration		
Centripetal Acceleration		
Force		
Momentum		
Kinetic Energy		

a)

b)

a)

b)

c)

2) What are the vector directions for angular quantities?

3) Explain what centripetal and centrifugal forces are.

Relationships between angular and translational quantities

4) Give the relationship between translational velocity and angular velocity.

5) Give the relationship between angular acceleration and centripetal acceleration.

6) What is Torque?

- 7) What is the moment of Inertia?
- 8) What happens, due of the conservation of angular momentum, when a person who is spinning pulls in her arms?
- 9) What happens as a comet approaches the sun?
- 10) What happens as two people round a turn in different lanes on the highway?

Exercises:

- 11) Find θ , if $s = 10\text{m}$ and $r = 3\text{ m}$.
- 12) Find θ if $s = 1.5\text{ m}$ and $r = 6\text{ m}$.
- 13) Find θ if $s = 45\text{ m}$ and $r = .5\text{ m}$.
- 14) Find the angular speed if $\Delta\theta$ is 3 meters and the time is 20 seconds.
- 15) Find the angular speed if $\Delta\theta$ is 6 meters and time is 2 minutes.
- 16) Find the change in displacement if the angular speed is $3\pi\text{ rads/s}$ and the time is 45 seconds.
- 17) Find the angular acceleration if the angular speed is $15\pi\text{ rads/s}$ and the time is 20 seconds.
- 18) Find the angular acceleration if the angular speed is $33\pi\text{ rads/s}$ and the time is 10 minutes.
- 19) For problem 14 find the related translational velocity if the radius is 3 meters.
- 20) For problem 15 find the related translational velocity if the radius is 10 meters.
- 21) For problem 1 find the related translational acceleration if the radius is 5 meters.
- 22) Find the centripetal acceleration if the radius is 3 meters and the translational velocity is 35 m/s.
- 23) Find the centripetal acceleration if the radius is 5 meters and the angular velocity is $15\pi\text{ rads/s}$. If the mass were 45 kg, what would the centripetal force be? What would the centrifugal force be?