Name:_____ ID:_____

Physics 202

Quizbit 1

Week 3 Winter 2023

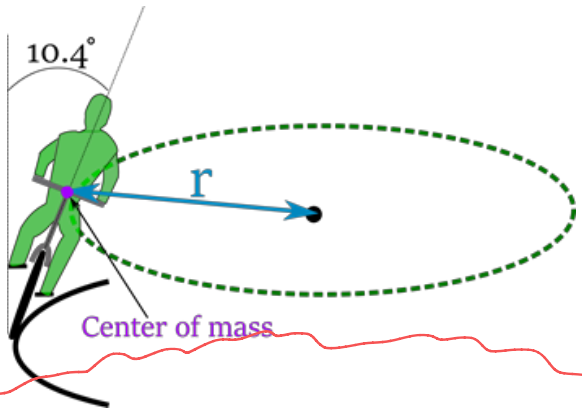
Collaboration is not allowed. Allowed on your desk are: three 8.5 x 11 inch doubled sided sheets of notes that are bound together, non-communicating graphing scientific calculator, a page of scratch paper, writing utensils, and the exam. You will have 25 minutes to complete this exam.

For questions 1 through 2 **fill in the square** next to all correct answers. A given problem may have more than one correct answer. Each correctly bubbled answer will receive two points. There are **3** correct answers in this section and only the first **3** filled in answers will be graded. There is no partial credit.

1. A dumbbell-shaped object is composed of two equal masses, **m**, connected by a rod of negligible mass and length **r**. If $\mathbf{I_1}$ is the moment of inertia of this object with respect to an axis passing through the center of the rod and perpendicular to it and $\mathbf{I_2}$ is the moment of inertia with respect to an axis parallel to the first axis but passing through one of the masses, it follows that:
   - □ (a) $\mathbf{I_1 = I_2}$
   - □ (b) $\mathbf{I_1 > I_2}$
   - ■ (c) $\mathbf{I_1 < I_2}$

2. A disk is spinning with an angular velocity **ω** and an angular acceleration **α**. For which of the following cases would the disk rotation be slowing down?
   - □ (a) **α** is negative, **ω** can be positive or negative
   - □ (b) **α** is positive, **ω** can be positive or negative
   - □ (c) **ω** is negative, **α** can be positive or negative
   - □ (d) **ω** is positive, **α** can be positive or negative
   - □ (e) **α** is negative, **ω** is negative
   - ■ (f) **α** is negative, **ω** is positive
   - ■ (g) **α** is positive, **ω** is negative
   - □ (h) **α** is positive, **ω** is positive

3. (4 points) The circle near the south-west corner of OSU-Cascades Campus has a radius of about 25.0 meters. Suppose a cyclist is traveling around the circle at the maximum speed possible and is leaning at a constant 10.4 degrees relative to the vertical as shown in the image below. Use a torque analysis, with a reference axis at the center of mass, to determine the coefficient of static friction between the tires and the road. (*Hint:* The cyclist has no angular acceleration about the center of mass.)



PHYSICAL REPRESENTATION

VECTORS & GEOMETRY TO FIND ANGLES

PHYSICS

$$\Sigma \tau_{cm} = I_{cm}\alpha$$

$$\tau_{cm}^{g} + \tau_{cm}^{N} + \tau_{cm}^{F_{s\,max}} = 0$$

$$-RF^{N}\sin\theta_{N} + RF^{f_{s\,max}}\sin\theta_{f} = 0 \qquad F^{f_{s\,max}} = \mu_s F^{N}$$

ALGEBRA

$$\mu_s = 0.184$$