• Walk-In tutoring at Broward Hall
• Private-Appointment, one-on-one tutoring at Broward Hall
• Walk-In tutoring in LIT 215
• Supplemental Instruction
• Video resources for Math and Science classes at UF
• Written exam reviews and copies of previous exams

The teaching center is located in the basement of Broward Hall:

You can learn more about the services offered by the teaching center by visiting https://teachingcenter.ufl.edu/
1. A 5.0 kg block is accelerated from rest by a compressed spring with spring constant 500 N/m. The spring is initially compressed 1.0 m from its relaxed length. The block then slides over a horizontal surface with coefficient of static friction 0.2. The region of friction begins exactly where the spring releases the block. How far from its initial position does the block slide?

   A. 25.5 m   B. 21.2 m   C. 24.3   D. 23.9   E. 26.5

2. The potential energy function of a 2.0 kg particle is given by

   \[ U(x) = 1.0 J + (4.0 J/m^2)x^2 + (1.0 J/m^3)x^3 \]

   where \( x \) is measured in meters. The particle has velocity 20.0 m/s when \( x = 5.0 \) m. What is its velocity at \( x = 0 \) m?

   A. 20 m/s   B. 22 m/s   C. 23 m/s   D. 25 m/s   E. 26 m/s

3. Two cars, A and B, have masses of 2000 kg and 1500 kg respectively. Determine the magnitude of \( v_b \) if the cars collide and stick together while moving with a common speed in the direction shown

   A. 11.86 m/s   B. 14.82 m/s   C. 17.33 m/s   D. 4.14 m/s   E. 26.00 m/s
4. Two metal plates of uniform density are arranged as shown in the figure. The circular plate has radius 1.0m, and the rectangular plate has dimensions 2.0m × 1.0m. Both have mass $M$. What is the distance from the origin to the center of mass of the entire body?

A. 2.0m  B. 1.4m  C. 2.6m  D. 2.1m  E. 2.3m

5. A bike wheel is quickly accelerated to an angular velocity of 50 rad/s and then allowed to spin down at a constant angular acceleration until it comes to rest. If the wheel comes to rest after 25 seconds, then how many revolutions did the wheel spin while decelerating?

A. 120.4 rev  B. 99.5 rev  C. 625.0 rev  D. 1250.0 rev  E. 198.9 rev

6. Three thin rods of mass $M$ are oriented as shown in the figure: one is aligned with the $x$-axis and has length $L/2$; one is aligned with the $y$-axis and has length $L$; and one is aligned with the $z$-axis and has length $L$. The center of the two rods of length $L$ is at the origin. What is the rotational inertia of the system (as a multiple of $ML^2$) about the indicated axis (which is parallel to the $y$-axis at $x = L/4$)?

A. $11/48$  B. $1/4$  C. $17/64$  D. $7/32$  E. $5/12$
7. A disc rotates like a merry-go-round while undergoing a torque given by \( \tau = (1 + 3t^2) \text{Nm} \). If the angular momentum is \( 2\text{kg m}^2/\text{s} \) at \( t = 0 \text{s} \), what is its angular momentum at \( t = 2\text{s} \)?

A. 10kg m\(^2\)/s  
B. 14kg m\(^2\)/s  
C. 5kg m\(^2\)/s  
D. 8kg m\(^2\)/s  
E. 12kg m\(^2\)/s

8. A solid ball, initially at rest at height \( H = 1.35\text{m} \), rolls smoothly down the slope indicated in the figure. After it leaves the horizontal section of the track at height \( h = 1\text{m} \), what is its translational velocity?

![Diagram of a ball rolling down a slope]

A. 2m/s  
B. 2.2m/s  
C. 1.7m/s  
D. 2.5m/s  
E. 2.7m/s

9. Near the surface of the Earth, a wooden block with mass \( m = 2\text{kg} \) is attached to a string. The string is wrapped around a frictionless pulley with radius \( R = 0.5\text{m} \) and rotational inertia \( I = 2.5\text{kgm}^2 \) as shown in the figure. The pulley and the block are initially at rest. When the system is released, and the string begins to unwind, what is the tension in the string (in N)?

![Diagram of a pulley and block system]

A. 16.33  
B. 22.62  
C. 28.00  
D. 19.60  
E. 0

10. A massless beam is pinned to the wall at point \( A \), and is suspended from the ceiling by a steel cable. Cable segment \( DB \) is 10 m long. At point \( C \) a cylinder of weight 80 N hangs from a rope. Determine the tension in the cable holding the beam up.

![Diagram of a beam and cylinder system]

A. 13 N  
B. 25 N  
C. 80 N  
D. 75 N  
E. 40 N