Disclaimer: This mock exam is only for practice. It was made by tutors in the Polytechnic Tutoring Center and is not representative of the actual exam given by the Academic Department.

1. If vector $A = 8i - 3j$ and vector $B = 5i + 7j$, what is the magnitude of vector $C = A - B$?
   a) 10.4 units  b) 10.0 units  c) 9.5 units  d) 12.6 units  e) 11.2 units

2. If a football is kicked from a tee on the ground with an initial speed of 22m/s at an angle of 25 degrees above the horizontal, how far away does the ball land?
   a) 34.6 m  b) 37.9 m  c) 35.4 m  d) 38.7 m  e) 31.5 m

3. A box of unknown mass is on a weighing scale inside an elevator headed to the top of a building. The elevator accelerated from rest at a constant rate until it reached a velocity of 10m/s. This was achieved after 10s. During these 10 seconds, the weighing scale suggested that the block had an apparent mass of 20kg. What is the mass of the box?
   a) 17.4 kg  b) 21.4 kg  c) 20.3 kg  d) 19.2 kg  e) 18.1 kg

4. A boy is on an amusement park ride. The seat of the ride is connected to a non-moving point 10m off the ground by a massless cable. When the ride starts the boy spins around the point at a constant speed. What is the minimum speed the ride must spin the boy so that the ride does not fail?
   a) 10.9 m/s  b) 8.9 m/s  c) 11.9 m/s  d) 9.9 m/s  e) 12.9 m/s

5. A 3 kg block is connected to a massless spring hanging from the ceiling. The spring is completely compressed and released. The block reached a maximum distance of 8cm from the ceiling. If the neutral position of the spring is 3cm from the ceiling, what is the spring constant?
   a) 0.94 kN/m  b) 1.94 kN/m  c) 2.94 kN/m  d) 3.94 kN/m  e) 4.94 kN/m
6. A bullet with mass of 10 g hits a wood block hanging from a rope (rope length is .7m and block mass 1.5kg) horizontally with speed 300m/s, and then becomes embedded into the block. What maximum height does the block-bullet system swing to?

   a) .201 m  b).235 m  c) .303 m  d) 1.85 m  e) 4.56m

7. At an amusement park a 300 kg bumper car traveling 4m/s to the right car collides head on with a 150kg bumper car traveling 7m/s to the left. What is the speed of the 150 kg bumper car after the collision if the 300kg bumper car moves at 3m/s to the right after colliding?

   a) 5 m/s to the right  b) 5 m/s to the left  c) 7 m/s to the right  d) 7 m/s to the left

8. A 50 kg skier is traveling at a constant speed of 5m/s at the top of a 1000m hill. How fast will the skier travel at the bottom of the slope?

   a) 138.2m/s  b) 139.5 m/s  c) 142.0 m/s  d) 144.5 m/s  e) 140.1 m/s

9. A 30 kg child is being pulled on a sled with negligible mass at an angle of 25 degrees from the horizontal and a force of 1000N. The coefficient of kinetic friction between the sled and the snow is 0.35. What is the acceleration of the child?

   a) 28.7m/s²  b) 25.6 m/s²  c) 31.8 m/s²  d) 33.4m/s²  e) 30.3 m/s²

10. A car is traveling at a constant speed around a U-turn with a 15° incline. The radius of the turn is 30m, what is the speed of the car?

    a) 8.76 m/s  b) 9.42 m/s  c) 7.34 m/s  d) 8.57 m/s  e) 10.32 m/s