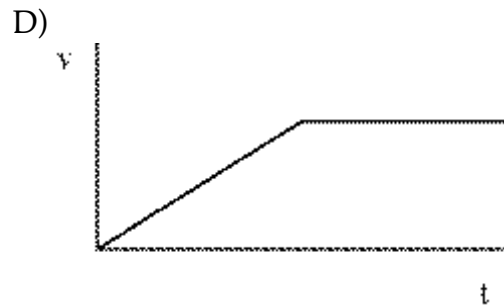
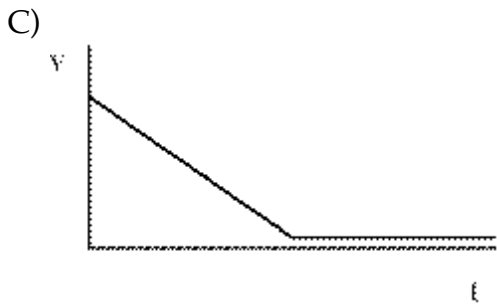
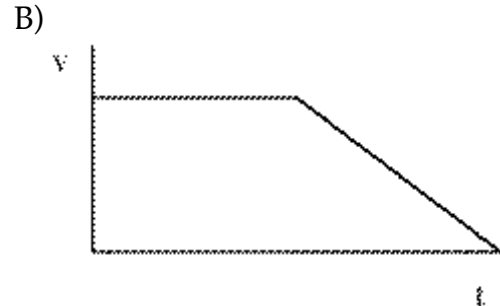
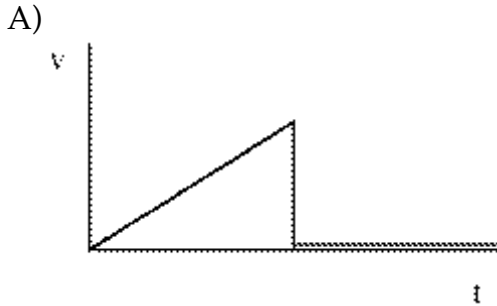


INSTRUCTIONS: Use a pencil #2 to fill your scantron. Write your code number and bubble it in under "EXAM NUMBER;" an entry in error will result in an automatic 10% deduction. Bubble in the quiz form (see letter A--D at bottom of page) in your scantron under "TEST FORM;" an error entering the "test form" will result in automatic 20% deductions, and may lead to disqualification. Write your name and 3-digit ID at the bottom of this page and turn it in with your scantron when you are finished working on the exam.

- 1) A trolley starts from rest and runs down a sloping track section onto a second, level section as shown. Friction is negligible.

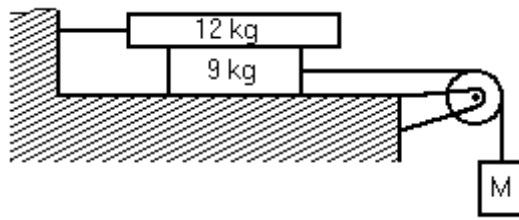


Which velocity-time graph below best represents the trolley's motion on both sections?
Take displacement to be measured along the path of the trolley, increasing to the right.



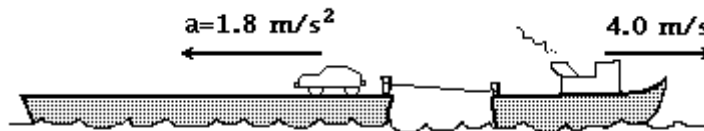
Name _____ Student 3-digit ID _____

- 2) If you jumped out of a plane, you would begin speeding up as you fall downward. Eventually, due to wind resistance, your velocity would become constant with time. After this occurs, the magnitude of the force of wind resistance is
- A) is much smaller than the force of gravity acting on you.
 - B) is slightly smaller than the force of gravity acting on you.
 - C) is greater than the force of gravity acting on you.
 - D) equal to the force of gravity acting on you.
- 3) A dog is standing in the tail bed of a pickup truck. The tail bed is coated with ice, causing the force of friction between the dog and the truck to be zero. The truck is initially at rest, and then accelerates to the right, moving along a flat road. As seen from a stationary observer (watching the truck move to the right), the dog
- A) does not move left or right, but the back of the truck moves towards the dog.
 - B) moves to the left, as the truck moves to the right, causing the dog to slide towards the back of the truck.
 - C) moves to the right at the same rate as the truck, so it doesn't slide.
 - D) moves to the right, but not as quickly as the truck is moving to the right, causing it to slide towards the back of the truck.
- 4) A large truck collides head-on with a cyclist. During the collision
- A) the truck exerts the same amount of force on the cyclist as the cyclist exerts on the truck.
 - B) the truck exerts a greater amount of force on the cyclist than the cyclist exerts on the truck.
 - C) the truck exerts a force on the cyclist, but the cyclist exerts no force onto the truck.
 - D) the truck exerts a smaller amount of force on the cyclist than the cyclist exerts on the truck.
- 5) Future space stations will create an artificial force of gravity by rotating. Consider a cylindrical space station of 390 m diameter rotating about its axis. Astronauts walk on the inside surface of the space station. What rotation period will provide "normal" gravity?
- A) 4.4 s
 - B) 40 s
 - C) 6.3 s
 - D) 28 s
- 6) An object starts moving at $t = 0$, and its position is given by $x = bt^3 - Ct^2$. At what time (other than $t = 0$) is the instantaneous velocity at t equal to the average velocity in the interval $[0, t]$? Assume $b = 4.2 \text{ m/s}^3$ and $C = 3.2 \text{ m/s}^2$.
- A) 0.34 s
 - B) 0.27 s
 - C) 0.38 s
 - D) 0.46 s



7) A system comprising blocks, a light frictionless pulley, and connecting ropes is shown. The 9 kg block is on a smooth horizontal table ($\mu = 0$). The surfaces of the 12 kg block are rough, with $\mu = 0.30$. The mass M is set so that it descends at constant velocity when released. The mass M is closest to:

- A) 2.4 kg B) 3.6 kg C) 3.3 kg D) 2.7 kg E) 3.0 kg



8) A flat-topped barge is being towed by a tugboat at a constant velocity of 4.0 m/s. A car, on the barge at the front end, starts from rest at time $t = 0$ s and moves towards the rear of the barge with a constant acceleration of 1.8 m/s^2 . Consider all velocities in the direction of the towing as positive. The velocity of the car, relative to land, when it has moved 22 m on the barge is closest to:

- A) -5 m/s B) +9 m/s C) -13 m/s D) -9 m/s E) +5 m/s

9) A hobby rocket reaches a height of 72.3 m and lands 111 m from the launch point. What was the angle of launch?

- A) 67.4° B) 22.6° C) 69.0° D) -44.8°

10) An object moves such that its x coordinate is given by $x(t) = -3.00 \text{ m} + (2.00 \text{ m/s}^2)t^2$ and its y coordinate is given by $y(t) = (2.00 \text{ m/s})t + (1.00 \text{ m/s}^2)t^2$. In what direction is the object moving at time $t = 2.00$ s relative to the \hat{i} direction?

- A) 15.3° counterclockwise
 B) 74.7° counterclockwise
 C) 53.1° counterclockwise
 D) 53.1° clockwise
 E) 36.9° counterclockwise

Answer Key

Testname: MIDTERM1-PRACTICE

- 1) D
- 2) D
- 3) A
- 4) A
- 5) D
- 6) C
- 7) B
- 8) A
- 9) C
- 10) E

Name _____ Student 3-digit ID _____