

## EXAM I Physics 218 2016

Name.....Section Number.....

### USEFUL INFORMATION

$$\text{If } f(x) = kx^n \quad \frac{df}{dx} = nkx^{n-1}$$

$$\text{If } f(x) = kx^n \quad \int f(x)dx = \frac{1}{n+1}kx^{n+1} + C$$

For the **SPECIAL CASE:**

#### CONSTANT ACCELERATION IN ONE DIMENSION

$$v(t) = a_c t + v(0)$$

$$x(t) = \frac{1}{2}a_c t^2 + v(0)t + x(0).$$

$$v^2(t_2) - v^2(t_1) = 2a_c [x(t_2) - x(t_1)]$$

Please Note: The symbol  $g$  stands for the magnitude of the acceleration vector due to gravity and, as such, it is a positive quantity.

**Free Body Diagrams are very important**

**Do Not Spend Too Much Time on Algebra!**

1.

2.

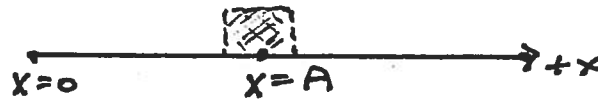
3.

4.

1. (25 Points) A block of mass  $m$  is moving along a straight line in the  $+x$  direction. Its velocity is measured and found to be a function of time given by

$$v_x(t) = c_1 t + c_2 t^2.$$

If the block was at the point  $x = A$  at the time  $t = 2\text{sec}$ , find its position as a function of time. Here  $A$ ,  $c_1$  and  $c_2$  are known constants.

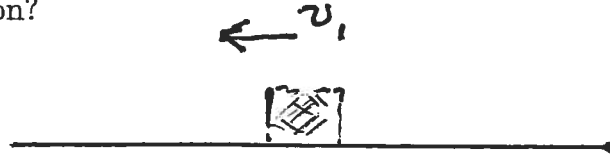


**Law or Definition**

**Application**

**Result**

2. (25 Points) A block of mass  $m$  is moving to the left with a velocity of magnitude  $v_1$ . At  $t = 0$  a force is exerted on the block, pointing to the right with magnitude  $c_1 t$  where  $c_1$  is a known constant. How far will the block travel to the left before it reverses its direction of motion?

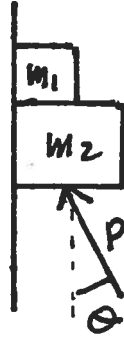


**Law or Definition**

**Application**

**Result**

3. (25 Points) A block of mass  $m_1$  is placed on top of a block of mass  $m_2$ . You push the two blocks, so that they move up a vertical wall, with a constant force of magnitude  $P$  directed at the angle  $\theta$  as shown. The coefficient of friction between the block of mass  $m_2$  and the wall is  $\mu$ . There is no friction between the blocks and no friction between block  $m_1$  and the wall. Find the force exerted by the lower block on the upper block.



Law or Definition

Application

Result

4. (25 Points) A missile is launched with velocity of magnitude  $v_m$  at an angle  $\theta$  with the horizontal. Once launched it has a horizontal acceleration that is given by  $Bt$  where  $B$  is a known constant and  $t = 0$  is the instant of the launch. What would the range (horizontal distance) of the missile be?

**Law or Definition**

**Application**

**Result**