

I. A student is measuring the acceleration of gravity  $g$  by  
a. Finding the velocity after the mass dropped a  
 distance  $x$  and using the following equation

$$v^2 = 2gx$$

to solve for  $g$ . let  $u_x = 0.5 \text{ cm}$ ;  $x = 2 \text{ m}$ ;  $v = 40 \text{ m s}^{-1}$ ;  $u_v = 1 \text{ m s}^{-1}$

b. Finding the time  $t$  it takes to reach the ground  
 after falling a distance  $x$ . the equation

$$x = \frac{1}{2} g t^2$$

is used to solve for  $g$ .

If  $u_x = 0.5 \text{ cm}$ ;  $x = 2 \text{ m}$ ;  $t = 0.7 \text{ s}$   $u_t = 0.1 \text{ s}$

What method will yield the lowest uncertainty in  
 the acceleration of gravity  $g$ ? EXPLAIN & SHOW  
 THE MATH.

SOLVE BY USING SENSITIVITY INDICES

II For case a) in the previous problem, is it possible to reduce the error by half by using more precise measurements for  $x$ ? Explain & Show the math.

III. Use the method described by equations 4.2.11 through 4.2.16 for question b in problem I.