

CLASS: PHY _____

STUDENT #: _____

NAME: _____

Assignment 2: KINEMATICS 2-D Motion

Assigned: Sept 16 14:30 Due: September 23 19:00

- 1 By algebraic manipulation of the first two kinematic equations for one-dimensional motion:

$$1) v_f = v_i + at \quad 2) x_f = x_i + v_i t + \frac{1}{2} at^2$$

Obtain the other two kinematic equations: $3) v_f^2 - v_i^2 = 2a\Delta x$ $4) x_f = x_i + \frac{1}{2}(v_i + v_f)t$

- 2 A test rocket is fired vertically upward from a well. A catapult gives it initial velocity 60.0 m/s at ground level. Its engines then fire and it accelerates upward at 5.00 m/s² until it reaches an altitude of 1 000 m. At that point its engines fail and the rocket goes into free fall, with an acceleration of -9.80 m/s². (a) How long is the rocket in motion above the ground? (b) What is its maximum altitude? (c) What is its velocity just before it collides with the Earth? (You will need to consider the motion while the engine is operating separate from the free-fall motion)

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Assignment 2: KINEMATICS 3-D Motion CONT

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3 An artillery shell is fired with an initial velocity of 300 m/s at 55.0° above the horizontal. It explodes on a mountainside 42.0 s after firing. If x is horizontal and y vertical, find the (x, y) coordinates where the shell explodes.

4 A car travels in a flat circle of radius R . At a certain instant the velocity of the car is 24 m/s west, and the total acceleration of the car is 2.5 m/s^2 53° north of west. Find the total acceleration of the car. How long will it take for the car to make a one full circle from the point at which its velocity is 24 m/s west?

5 The projectile motion is fired with velocity of magnitude v_0 at the angle θ . Find θ for which the maximum elevation of the projectile is twice its range.