Please follow the Individual Revision guidelines provided during the Collaborative Reflection workshop in the Week 5 Problem Session. A * notes that the numbers in the problem are different than on the original exam and collaborative reflection version

3. Consider the graph associated with the function $f(x) = mx + b$, for the case where m and b are **positive**.

a) If you only **increase** m, describe what happens to the **steepness** of the graph, the **vertical intercept**, and the **horizontal intercept**. Briefly explain.

b) If you only **decrease** b, describe what happens to the **steepness** of the graph, the **vertical intercept**, and the **horizontal intercept**. Briefly explain.

4. Consider the graph associated with the function $g(x) = Ax^2 + Bx + C$, for the case where A, B, and C are **positive**.
For each case below, consider what happens to the vertical intercept of the graph and the vertex.

a) If you only **decrease** C, describe what happens to the **vertical intercept** and the **vertex**. Briefly explain.

b) If you only **change** B **to equal 0**, describe what happens to the **vertical intercept** and the **vertex**. Briefly explain.

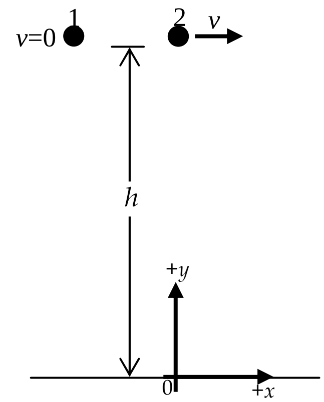
7. Two identical steel marbles are released from height *h* above the floor at the same time. Marble 1 is released from rest. Marble 2 is launched with horizontal velocity *v*. **Note the coordinate system and origin indicated on the figure**. Neglect air resistance.

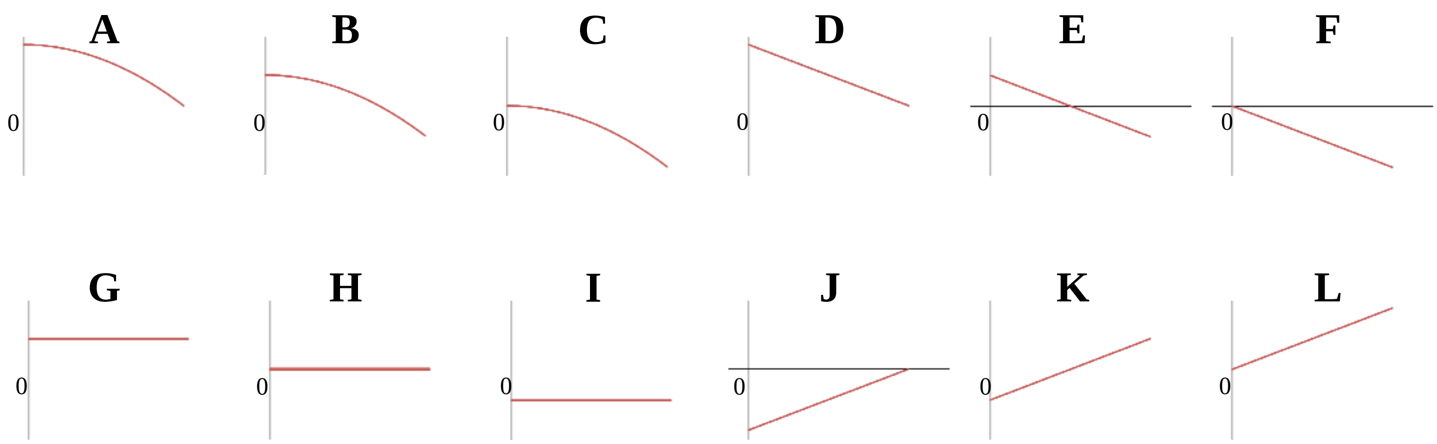
i) Consider **Marble 1**, released from rest. Which graphs best represent Marble 1's *x*-components of acceleration, velocity, and position? Briefly explain your reasoning.

ii) Consider **Marble 1**, released from rest. Which graphs best represent Marble 1's *y*-components of acceleration, velocity, and position? Briefly explain your reasoning.

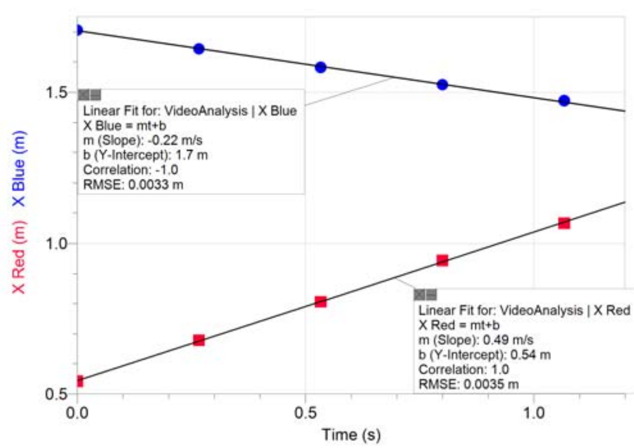
iii) Consider **Marble 2**, launched horizontally with speed v. Which graphs best represent Marble 2's *x*-components of acceleration, velocity, and position? Briefly explain your reasoning.

iv) Consider **Marble 2**, launched horizontally with speed v. Which graphs best represent Marble 2's *y*-components of acceleration, velocity, and position? Briefly explain your reasoning.





8. Video analysis was used to obtain the position vs. time for two objects. The Red object is represented by the squares, and the Blue object is represented by the circles. Best fit lines are also shown. Determine where the objects will pass each other.



9*. An object moved in a straight line in the positive direction. The object began with initial speed 6 m/s and slowed down at a constant rate of 0.2 m/s^2 for 5 s at which point it moved at constant speed for the next 5 s. Determine how far the object traveled between 0 s and 10 s using both graphical and analytical methods.

10*. For the quadratic function $f(x) = -3x^2 + 4x - 1$, determine the vertex and the vertical and horizontal intercepts. Show your work and confirm by graphing the function.

11*. A motorboat travels 960 miles down the river with the current. When the motorboat returns the 960 miles, it is moving against the current, so it travels 4 miles per hour slower (with respect to the river bank) and the trip takes 20 hours longer. Determine the time it takes the boat to make each part of the trip and the speed of the current. Make sure to check your answers to see that they are consistent with the given information.

12*. The Tortoise can build a shed in 15 days. The Hare can build the shed in 5 days. How long does it take them to build the shed if they work together? To increase the clarity of your response, include sufficient units so that your reasoning is clear.

13*. A motorcycle moving at constant speed 35 m/s on a straight road passes a stationary police car. At that instant, the police car begins to move with constant acceleration 2 m/s^2 in the same direction as the motorcycle. Determine how long it takes the police car to catch up to the motorcycle after the motorcycle passes by.

14*. A rocket, launched with an initial speed of 39.2 m/s, travels straight up and down. Neglecting air resistance, its height (in meters) as a function of time (in seconds) between when it is launched and when it lands is given by

$y = -4.9t^2 + 39.2t$.

i) Determine the maximum height of the rocket, and its total travel time (from launch to land). Do this in 3 different ways: using the vertex form, using the quadratic formula, and just using the constant acceleration kinematics formulas (in all cases you can use your physics knowledge of the situation).

ii) Determine when the rocket is at a height of 78.4 m. Do this in 2 different ways: solving a quadratic (using either vertex form or quadratic formula) and just using the constant acceleration kinematics formulas (in both cases you can use your physics knowledge of the situation).

15*. A rectangle is bound by the x-axis, the y-axis, and the line $y = 12 - 2x$. What is the maximum area of such a rectangle?