**PHY 101** **Quizzam 2** **June 10, 2021**

Name: _____

Please show all of your work, no credit will be given if there is no work. Partial credit will be given where warranted, so show me your physics reasoning. Do not forget to give units for numeric answers and use appropriate significant figures.

This quizzam is open notes and open book but not open internet, i.e. do not google the problems for solutions.You have 45 minutes to complete this quizzam. Good luck!

1. (2 points) Is it possible to throw a ball backwards off of a moving truck in such a way that it appears to have no horizontal motion relative to an observer on the ground? If so, what does its motion look like to the person who threw it?

2. (2 points) How are weight and mass related? Which is an intrinsic, unchanging property of an object and which depends on where that object is?

3. (1 point) Why does an ordinary rifle recoil (kick backward) when fired?

4. (3 points) A daredevil is attempting to jump his motorcycle over a line of buses parked end to end by driving up a 32º ramp at a speed of 40.0 m/s (144 km/h). How many buses can he clear if the top of the takeoff ramp is at the same height as the bus tops and the buses are 20.0 m long?

5. (3 points) A ship sailing in the Gulf Stream is heading 25.0 ° west of north at a speed of 4.00 m/s relative to the water. Its velocity relative to the Earth is 4.80 m/s at a bearing of 5.00° west of north. What is the velocity of the Gulf Stream? (Be sure to give both a magnitude and a direction)

6. (3 points) What force does a trampoline have to apply to a 45.0-kg gymnast to accelerate her straight up at 7.50 m/s^2? Note that the answer is independent of the velocity of the gymnast—she can be moving either up or down, or be stationary.

7. (2 points) I am mowing my lawn and exerting force horizontally on the handle of my lawnmower. Draw a free body diagram for the system containing just the lawnmower. Be sure to include all external forces, including friction, gravity, and normal forces.

8. BONUS: (1 point) I mentioned in class that most of the contact forces we've talked about are actually the result of one of the four fundamental forces acting on the atoms and molecules that make up large objects. Which of these four forces was it?