This group quiz has 5 questions of equal value.

1. A force of 60 Newtons (about a dozen pounds of force) stretches the rubber band of a slingshot to $x = 0.05$m (about 2 inches) from its resting position. You load a 0.01kg ball into the slingshot and stretch the band to $x = 0.15$m from its resting position. Assuming all energy spent stretching is converted to kinetic energy ($mv^2/2$), what is the muzzle velocity of the ball?

   You **may use a calculator** for the following problem only:

2. Sometimes a glass is rather half-empty than half-full.

   The shape of the inside of an 8-inch tall beer glass in Armadillo Wings can be approximated by a solid of revolution obtained by rotating the curve $x = (y/8)^2$ around the line $x = -1$. How much beer is left afer drinking half the glass by height (that is, up to 4 in mark) as a percentage of the full glass?

   For the following problems, **do not evaluate the integral**.

3. Zombie apocalypse strikes, and your best friend becomes a zombie. You want to transfer fuel from your friend's motorcycle to your zombie-proof truck. The cap of your gas tank is 0.4m above the cap of your friend's gas tank, which is spherically shaped and has the cap at the top.

   Given that your friend's tank has a diameter of 0.6m and the fuel fills it to the 0.45m mark, write the integral to compute how much energy you will spend pumping it into your tank.

4. A solid bounded by curves $x = (y - 2)^2$ and $x = -(y - 2)^2 + 4$ is rotated around $y = -1$. Write the integral which computes the volume of the obtained solid using the washers method.

5. Write the integral to compute the volume of the same solid using the shells method.

   Homework problem: In the old times, before cargo elevators were invented, the furniture was lifted into apartments by ropes through the windows. The walls of buildings were slightly slanted to allow for the rope to hang from the rooftop.

   Calculate the work performed by lifting a 100kg piano to the 4-th floor window (10m above the ground) by a rope which is pulled from the roof top (20m above ground) and which weighs 1kg per meter of length.