

This is problem 5 A. 4.

We have a fire hydrant with the same cross section everywhere. Let's call the velocity of the water here v_2 , and the velocity of the water here v_1 . The magnitudes are the same, and they're 25 meters per second. I have L kilograms of water per second flowing through there, and the velocity of v_2 and v_1 is 25 meters per second, and this number is given.

The velocity is changing from this to this-- the speed is not changing, but the velocity is changing. This is v_1 , and this is v_2 . The change in velocity-- this one is v_2 minus v_1 , and that's call that for simplicity Δv . If there is a change in velocity, there must be a force on the system. Remember the [UNINTELLIGIBLE], or let's write down Δp for now-- Δp Δt , which is a change of momentum per unit time-- that was an external force.

What is Δp ? In the extreme case, of course, when the Δ goes to 0, it becomes dp . Δp equals $m \Delta v$ -- this is Δv -- and this Δt . What is m divided Δt ? That's this L -- that's the number of kilograms per second. What is the magnitude of Δv ? The magnitude of Δv equals 25 times the square root of 2. What does it mean? It means that the wall must push on the water in this direction, in the same direction as Δp , and you can calculate the force.

Since action equals minus reaction, the water will push back on the wall in exactly the opposite direction but with the same magnitude. I think you have enough ammunition now to do this problem.