Weekly Free-Write

Composition for US Experience.

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One of the most fascinating concepts in mathematics and the physics must be division by zero. It is easy to take a number –say, nine—and divide it into three equal parts. Nine divided by three is exactly three, because three, three times is equal to nine; but what happens when one takes the same number and divides it into zero equal parts? It almost makes no sense to do so; zero no amount of times is equal to nine. But when is this supposed to make sense?

A lot of today’s scientific frontiers are limited by our understanding of division by zero. When we take many of science’s most important equations and equate their denominators to zero, things go completely out of whack; our very understanding of an equation stops making sense as the bottom of this equation approaches zero.

In newton’s gravity, we find that two objects are attracted to each-other the closer they get, and the distance between these two objects are noted in the bottom of the equation –its denominator. What happens as we take these two objects and start to bring them closer and closer? The force of attraction is supposed to increase toward infinity, as the closer the object gets, the greater the force; but what happens when two objects are exactly zero feet away from each-other. This means there is literally zero distance between them; they occupy the exact same space. Is the force between these two objects infinite? How can there even be a force between them if they occupy the same space? Can two objects occupy the exact same space and have absolutely no distance between them? It almost makes sense that as two objects get closer to each-other, the force between them increases, but that if all of a sudden they occupy the same space, there should be no force between them as there is no distance for them to be attracted within; but we just don’t have a comprehensive explanation of this concept because that would be defining division by zero, which is –as far as we know—mathematically impossible.

We also see strange implications in special relativity when we encounter division by zero. The posterchild equation of special relativity tells us that time itself slows down as one approaches the speed of light, and that time travel into the future is not only possible, but that astronauts already experience it at a microscopic level. This same equation has a structure that allows for division by zero to happen in exactly one instance, when the speed of an observer is equal to the speed of light. Physics allows us to understand that as an observer approaches the speed of light, someone who is measuring this observer’s velocity will effectively say that time itself approaches a standstill for the travelling observer. If Bob takes his clock and meets up with Mindy to synch their time before Bob decides to take his spaceship that can harness infinite amounts of energy and accelerate close to the speed of light to go to Mars and meet up again in 20 minutes, by the time Bob comes back, his clock will have only registered 20 minutes, while Mindy may not even be alive as 20 million years may have passed by and humanity could have well gone extinct by then. Distance is also predicted to contract under these velocities; so Bob might measure the distance to Mars rather than being the distance that would allow us to take months to travel there, as a distance that allows for him to take 10 minutes to go and 10 to be back. But what happens if Bob’s spaceship can travel at the very speed of light? In this case, the equation that describes special relativity acquires a term of a number divided by zero, and rather than slowing down, time literally is predicted to stop, and any measurable distance is contracted to literally nothing. Does Bob just transcend toward existing at all future times in the universe? He just exists always, everywhere, and in no particular time or space? How is this possible?

Although it is not possible to ask Boeing to build a spacecraft capable of harnessing infinite energy to accelerate to the speed of light, or to keep pushing atoms together past the point of fission that causes nuclear bombs to release catastrophic amounts of energy, it should be justified to keep on thinking about seemingly impossible concepts like division by zero; we never know what mysteries lie beyond infinity.