Note on Newton's law of universal gravitation and division by zero

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Abstract. This is a simple note for Newton's law of universal gravitation when the distance of the centers of two masses equals zero.

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The equation for universal gravitation is stated as follows:

$$F = G\frac{m_1 m_2}{r^2},$$

where F is the gravitational force acting between two objects, m_1 and m_2 are the masses of the objects, r is the distance between the centers of their masses, and G is the gravitational constant.

In this note we consider the case in which the centers of the masses coincide. Then the directions of the forces acting two object vanish. This implies

$$F = 0.$$

Notice that $r = 0$ in this case. While the definition of devision by zero in [1] states:

$$\frac{a}{0} = 0 \; for \; any \; real \; number \; a.$$

Therefore this also gives

$$F = 0.$$

References

[1] M. Kuroda, H. Michiwaki, S. Saitoh, M. Yamane, New meanings of the division by zero and interpretations on $100/0 = 0$ and on $0/0 = 0$, Int. J. Appl. Math., **27**(2) (2014) 191–198.