2024 F=ma Exam: Problem 22

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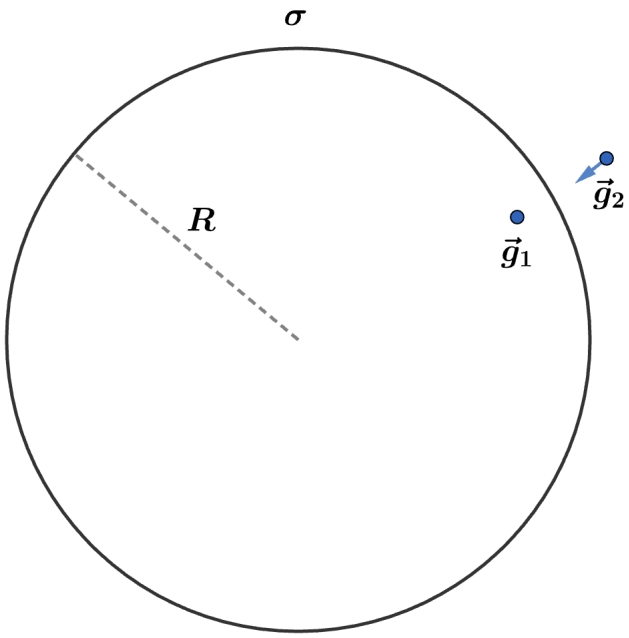

By the shell theorem, the gravitational field inside a spherical shell is

$$g_1 = 0$$

while the gravitational field outside is the same as that of a point located at the center,

$$g_2 = \frac{GM}{R^2}$$

Thus,

$$\Delta g = g_2 - g_1 = \frac{GM}{R^2} = \frac{G(4\pi R^2 \sigma)}{R^2} = 4\pi G\sigma$$

so the answer is $\boxed{\text{D}}$.