15.1, number 30: **Find the volume of the region bounded above by the elliptical paraboloid** $z = 16 - x^2 - y^2$ **and bounded below by the square** $0 \le x \le 2$ **and** $0 \le y \le 2$**.**

Answer: I filled up the square base using vertical lines. The volume is the integral over the base of the top, which is equal to

$$
\begin{aligned}
\int_0^2 \int_0^2 (16 - x^2 - y^2) \, dy \, dx &= \int_0^2 (16y - x^2 y - \tfrac{y^3}{3}) \Big|_0^2 \, dx \\
&= \int_0^2 32 - 2x^2 - \tfrac{8}{3} \, dx \\
&= (32x - \tfrac{2}{3} x^3 - \tfrac{8}{3} x) \Big|_0^2 \\
&= 64 - \tfrac{16}{3} - \tfrac{16}{3} \\
&= 16(4 - \tfrac{2}{3}) = \boxed{\dfrac{160}{3}}
\end{aligned}
$$