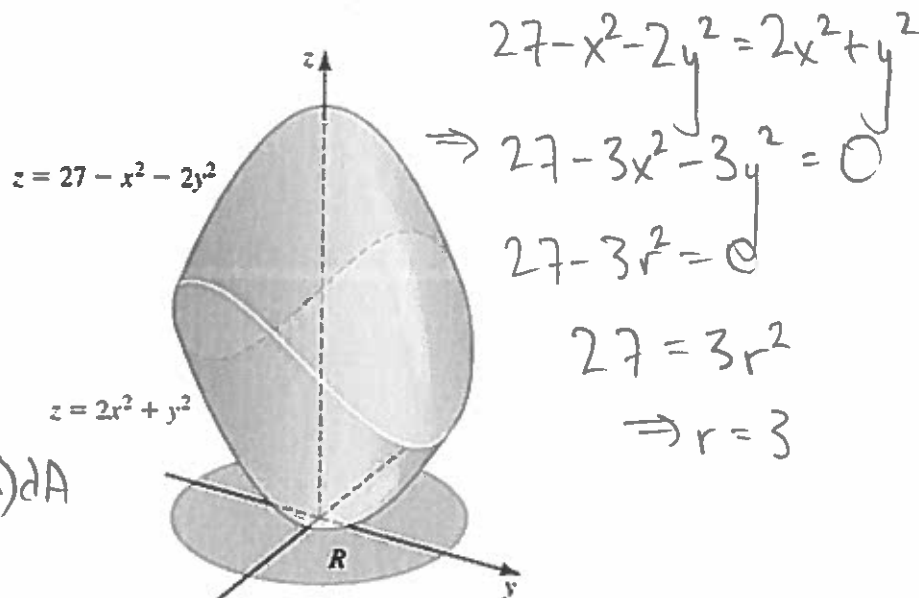


## In-Class Quiz 6: Double integrals in polar coordinates (§13.3)

Directions: This quiz is due at the end of lecture.

1. Find the volume of the solid bounded by the paraboloids  $z = 2x^2 + y^2$  and  $z = 27 - x^2 - 2y^2$  (see figure).



$$\text{Volume} = \iint_R (\text{top} - \text{bottom}) dA$$

$$= \iint_R (27 - x^2 - 2y^2) - (2x^2 + y^2) dA$$

$$= \iint_R (27 - 3x^2 - 3y^2) dA = \int_0^{2\pi} \int_0^3 (27 - 3r^2) r dr d\theta$$

$$= \int_0^{2\pi} \left[ \frac{27r^2}{2} - \frac{3r^4}{4} \right]_0^3 d\theta$$

$$\frac{3^5}{2} - \frac{3^5}{4} = \frac{3^5}{4} \quad \leftarrow \text{terms vanish}$$

$$= \int_0^{2\pi} \frac{3^5}{4} d\theta$$

$$= \frac{3^5}{4} \theta \Big|_0^{2\pi} = \boxed{\frac{3^5 \pi}{2}} \quad \leftarrow \text{terms vanish}$$