

1. (k points) How big is the parabolic segment between the parabola  $f(x) = \frac{x^2}{2}$  and the line  $g(x) = 4 + x$ ?

Sketch a graph to visualize the desired area.

**Solution:** The functions intersect at  $P_1(-2, 2)^T$  and at  $P_2(4, 8)^T$ . Thus, the area is

$$A = \int_{-2}^4 g(x) - f(x) \, dx = \int_{-2}^4 4 + x + \left(\frac{-1}{2}\right) x^2 \, dx = \left[4x + \frac{x^2}{2} - \frac{x^3}{6}\right]_{-2}^4 = 18.0$$

