

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

Sketch a graph to visualize the desired area.

**Solution:** The functions intersect at  $P_1(-1, 2)^T$  and at  $P_2(2, 8)^T$ . Thus, the area is

$$A = \int_{-1}^2 g(x) - f(x) \, dx = \int_{-1}^2 4 + 2x - 2x^2 \, dx = \left[ \frac{1}{3}x(12 + 3x - 2x^2) \right]_{-1}^2 = 2(-4 + 3x^2 - x^3)$$

