1. Warm-up.

Solve the integral $\int_{-2}^{2} \frac{1}{x^2}\,dx$.

2.

The temperature of a room $T(t)$ in °F at time t is given by

$$T(t) = 85 - 3\sqrt{25 - t} \text{ for } 0 \le t \le 25.$$

(a) Find the room's temperature when $t = 0$, $t = 16$ and $t = 25$.

(b) Find the room's average temperature for $0 \le t \le 25$.

3.

Archimedes discovered that the area under a parabolic arch is two-thirds the base times the height. Sketch the parabolic arch

$$y = h - \left(\frac{4h}{b^2}\right)x^2 \qquad \text{for} \qquad -\frac{b}{2} \le x \le \frac{b}{2},$$

assuming that h and b are positive. Then use calculus to find the area of the region enclosed between the arch and the x-axis.

4.

Using the FTC, evaluate $\int_0^1 x^2\,dx$. Then, evaluate it using right-handed Riemann sums (with equal-width subintervals) and the fact that

$$\sum_{k=1}^{n} k^2 = \frac{n(n+1)(2n+1)}{6}.$$