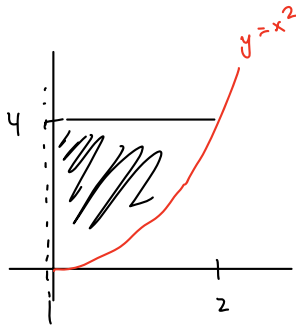


Math 1172 Homework #3

Section 5.3 #12, 28

Section 6.2* #64, 72

5.3 #12

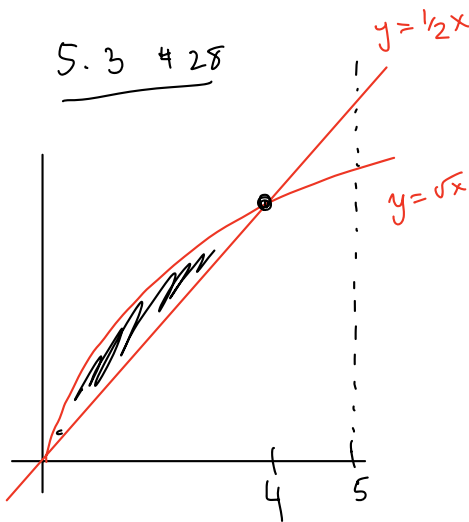


$$2\pi \int_0^2 x(4 - x^2) dx$$

$$= 2\pi \int_0^2 (4x - x^3) dx = 2\pi \left(2x^2 - \frac{1}{4}x^4 \right) \Big|_0^2$$

$$= 2\pi \left(2 \cdot 2^2 - \frac{1}{4} \cdot 2^4 \right) - 2\pi(0) = 8\pi$$

5.3 #28



Intersections:

$$y = \sqrt{x}, \quad y = \frac{1}{2}x$$

$$\sqrt{x} = \frac{1}{2}x$$

$$x = \frac{1}{4}x^2$$

$$4x = x^2$$

$$x^2 - 4x = 0$$

$$x(x - 4) = 0$$

$x = 0, \quad x = 4$

height: $\sqrt{x} - \frac{1}{2}x$

distance to axis: $5 - x$

$$\begin{aligned}
 2\pi \int_0^4 \left(x^{1/2} - \frac{1}{2}x \right) (5-x) dx &= 2\pi \int_0^4 5x^{1/2} - \frac{5}{2}x - x^{3/2} - \frac{1}{2}x^2 dx \\
 &= 2\pi \left(5 \cdot \frac{2}{3} x^{3/2} - \frac{5}{4} x^2 - \frac{2}{5} x^{5/2} - \frac{1}{6} x^3 \right) \Big|_0^4 \\
 &= 2\pi \left(\frac{10}{3} \cdot 4^{3/2} - \frac{5}{4} \cdot 4^2 - \frac{2}{5} \cdot 4^{5/2} - \frac{1}{6} \cdot 4^3 \right) - 0
 \end{aligned}$$

6.2 * #64

$$y = \frac{(x+1)^4 (x-5)^3}{(x-3)^8}$$

$$\ln y = 4 \ln(x+1) + 3 \ln(x-5) - 8 \ln(x-3)$$

$$\frac{1}{y} \frac{dy}{dx} = \frac{4}{x+1} + \frac{3}{x-5} - \frac{8}{x-3}$$

$$\frac{dy}{dx} = \left(\frac{4}{x+1} + \frac{3}{x-5} - \frac{8}{x-3} \right) \cdot y$$

$$\frac{dy}{dx} = \left(\frac{4}{x+1} + \frac{3}{x-5} - \frac{8}{x-3} \right) \frac{(x+1)^4 (x-5)^3}{(x-3)^8}$$

6.2 * #72

$$\int_e^6 \frac{1}{x \ln x} dx$$

$$u = \ln x$$

$$du = \frac{1}{x} dx$$

$$= \int_e^6 \frac{1}{u} \cdot \frac{1}{x} dx = \int \frac{1}{u} du = \ln|u|$$

$$= \ln|\ln x| \Big|_e^6 = \ln|\ln 6| - \ln|\ln e| = \ln(\ln 6) - \ln 1 = \ln(\ln 6)$$