5.2

11. $V = \pi \int_0^1 \left[\left(\frac{3}{2} - x^3\right)^2 - \left(\frac{3}{2} - x\right)^2\right] dx = \pi \int_0^1 \left(x^6 - 3x^3 - x^2 + 3x\right) dx = \pi \left(\frac{1}{7}x^7 - \frac{3}{4}x^4 - \frac{1}{3}x^3 + \frac{3}{2}x^2\right)\Big|_0^1 = \frac{47\pi}{84}$

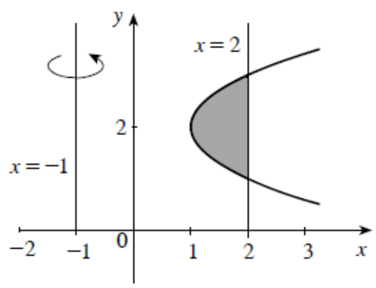
12. $V = \pi \int_0^1 \left[\left(\frac{3}{2} - y\right)^2 - \left(\frac{3}{2} - y^{1/3}\right)^2\right] dy = \pi \int_0^1 \left(y^2 - 3y - y^{2/3} + 3y^{1/3}\right) dy = \pi \left(\frac{1}{3}y^3 - \frac{3}{2}y^2 - \frac{3}{5}y^{5/3} + \frac{9}{4}y^{4/3}\right)\Big|_0^1$
$= \frac{29\pi}{60}$

37. $V = \pi \int_1^3 \left\{(-1-2)^2 - \left[-1 - \left(y^2 - 4y + 5\right)\right]^2\right\} dy$

$= \pi \int_1^3 \left[9 - \left(y^2 - 4y + 6\right)^2\right] dy$

$= \pi \int_1^3 \left(-y^4 + 8y^3 - 28y^2 + 48y - 27\right) dy$

$= \pi \left(-\frac{1}{5}y^5 + 2y^4 - \frac{28}{3}y^3 + 24y^2 - 27y\right)\Big|_1^3 = \frac{104\pi}{15}$



53. $V = \int_0^4 \left(2\sqrt{x}\right)^2 dx = 4\int_0^4 x\, dx = 2x^2\Big|_0^4 = 32$

5.3

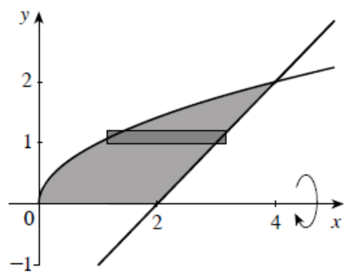
5. $V = 2\pi \int_0^4 y\left(y^{1/2} - \frac{1}{8}y^2\right) dy = 2\pi \int_0^4 \left(y^{3/2} - \frac{1}{8}y^3\right) dy = 2\pi \left(\frac{2}{5}y^{5/2} - \frac{1}{32}y^4\right)\Big|_0^4 = \frac{48\pi}{5}$

6. $V = 2\pi \int_0^2 (3-x)\left[\left(\frac{1}{2}x^2 + 2\right) - x^2\right] dx = 2\pi \int_0^2 \left(\frac{1}{2}x^3 - \frac{3}{2}x^2 - 2x + 6\right) dx = 2\pi \left(\frac{1}{8}x^4 - \frac{1}{2}x^3 - x^2 + 6x\right)\Big|_0^2 = 12\pi$

23. Solving $\sqrt{x} = x - 2 \Rightarrow x = x^2 - 4x + 4 \Leftrightarrow$ $x^2 - 5x + 4 = (x-4)(x-1) = 0$ gives $x = 1$ or 4. We reject $x = 1$ because it does not satisfy $\sqrt{x} = x - 2$. Thus, the point of intersection is $(4, 2)$. Using the method of cylindrical shells, we have

$V = 2\pi \int_0^2 y\left[(y+2) - y^2\right] dy = 2\pi \int_0^2 \left(-y^3 + y^2 + 2y\right) dy$

$= 2\pi \left(-\frac{1}{4}y^4 + \frac{1}{3}y^3 + y^2\right)\Big|_0^2 = \frac{16\pi}{3}$



29. $V = 2\pi \int_0^2 (4 - x)\, x\, dx$

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

$= 2\pi \left(2x^2 - \frac{1}{3}x^3\right)\Big|_0^2 = \frac{32\pi}{3}$