

Practice 1

1a $\frac{1}{3} x e^{3x} - \frac{1}{9} e^{3x} + C$

1b 0

1c $\pi/4$

1d $\ln |\sqrt{1+9x^2} + 3x| + C$

2a $V = \int_{-3}^3 \pi (\sqrt{9-x^2})^2 dx$

2b $V = \int_0^1 2\pi x (\sqrt{x} - (2x-1)) dx$

3 $L = \int_1^2 \sqrt{1 + \left(\frac{1}{x} - \frac{x}{4}\right)^2} dx$

4. $S = \int_1^5 2\pi \sqrt{x+4} \sqrt{1 + \left(\frac{1}{2\sqrt{x+4}}\right)^2} dx$

5. $\frac{A}{x} + \frac{B}{x^2} + \frac{C}{x-1} + \frac{D}{(x-1)^2} + \frac{E}{(x-1)^3} + \frac{Fx+G}{x^2+2x+2}$

6. $\lim_{L \rightarrow 2^+} \int_L^3 \frac{1}{x\sqrt{x^2-4}} dx + \lim_{L \rightarrow \infty} \int_3^L \frac{1}{x\sqrt{x^2-4}} dx$

Bonus

a 6

b 6

Practice 2

$$1a. V = \int_0^4 \pi \left[\left(\frac{1}{2}x + 2 \right)^2 - x^2 \right] dx$$

$$1b. V = \int_0^4 2\pi x \left[\left(\frac{1}{2}x + 2 \right) - x \right] dx$$

$$2. L = \int_0^\pi \sqrt{1 + (x \sin x)^2} dx$$

$$3. S = \int_{1/2}^{3/2} 2\pi \sqrt{2x - x^2} \sqrt{1 + \left(\frac{1-x}{\sqrt{2x-x^2}} \right)^2} dx$$

$$4. \frac{A}{x} + \frac{B}{x-100} + \frac{C}{(x-100)^2} + \frac{D}{(x-100)^3} \\ + \frac{Ex+F}{x^2+2x+12} + \frac{Gx+H}{(x^2+2x+12)^2}$$

$$5a. \frac{1}{2} \theta \sin(2\theta+1) + \frac{1}{4} \cos(2\theta+1) + C$$

$$5b. \frac{1}{12} \sin^6 2x - \frac{1}{8} \sin^8 2x + \frac{1}{20} \sin^{10} 2x + C$$

$$5c. \frac{1}{2} \cos(-\theta) - \frac{1}{22} \cos(11\theta) + C$$

$$5d. \frac{\pm \sqrt{1-v^2}}{v} - \sin^{-1} v + C$$

$$5e. \tan^{-1}(x+4) + C$$

$$5f. 3$$

$$\text{Bonus} \quad \frac{2}{3} x^{3/2} - x + 2x^{1/2} - 2 \ln |1+x^{1/2}| + C$$

Practice 3

$$1a \quad V = \int_0^2 \pi \left[\left(-\frac{5}{2}x + 5\right)^2 - (-x + 2)^2 \right] dx$$

$$1b \quad V = \int_0^2 2\pi x \left[\left(-\frac{5}{2}x + 5\right) - (-x + 2) \right] dx$$

$$2 \quad L = \int_{1/2}^{3/2} \sqrt{1 + \left(\frac{1-x}{\sqrt{2x-x^2}}\right)^2} dx$$

$$3 \quad S = \int_0^\pi 2\pi (\sin x - x \cos x) \sqrt{1 + (x \sin x)^2} dx$$

$$4. \quad \frac{A}{x} + \frac{B}{x-100} + \frac{C}{(x-100)^2} + \frac{Dx+E}{x^2+2x+12} \\ + \frac{Fx+G}{(x^2+2x+12)^2} + \frac{Hx+I}{(x^2+2x+12)^3}$$

$$5a \quad \frac{1}{3} x^3 \ln x - \frac{1}{9} x^3 + C$$

$$5b \quad -\frac{1}{12} \cos^6(2x) + \frac{1}{16} \cos^8(2x) + C$$

$$\text{OR} \quad \frac{1}{8} \sin^4(2x) - \frac{1}{6} \sin^6(2x) + \frac{1}{16} \sin^8(2x) + C$$

$$5c \quad \frac{1}{2} \cos(-\theta) - \frac{1}{14} \cos(7\theta) + C$$

$$5d \quad \sqrt{v^2 - 49} - 7 \sec^{-1}\left(\frac{v}{7}\right) + C$$

$$5e \quad \tan^{-1}(x+1) + C$$

$$5f \quad \text{diverges}$$

$$\text{Bonus} \quad 4 \ln(v^{1/4}) - 4 \ln|1 - v^{1/4}| + C$$