

Example set 1.2.3

$$\begin{aligned} 1. & \int_1^2 (3x^2 + 4x + 5) dx \\ &= \left[\frac{3x^{2+1}}{2+1} + \frac{4x^{1+1}}{1+1} + 5x \right]_1^2 \\ &= \left[\frac{3x^3}{3} + \frac{4x^2}{2} + 5x \right]_1^2 \\ &= [x^3 + 2x^2 + 5x]_1^2 \\ &= (2^3 + 2 \cdot 2^2 + 5 \cdot 2) - (1^3 + 2 \cdot 1^2 + 5 \cdot 1) \\ &= (8 + 8 + 10) - (1 + 2 + 5) \\ &= 26 - 8 \\ &= 18 \end{aligned}$$

$$\begin{aligned} 2. & \int_1^e \frac{1}{x} dx \\ &= [\ln x]_1^e \\ &= \ln e - \ln 1 \\ &= 1 \end{aligned}$$

$$\begin{aligned}
 3. \quad & \int_0^{\pi/2} \sin 2x \, dx \\
 &= \left[-\frac{1}{2} \cos 2x \right]_0^{\pi/2} \\
 &= -\left(\frac{1}{2} \cos 2 \cdot \frac{\pi}{2} - \frac{1}{2} \cos 2 \cdot 0 \right) \\
 &= -\left(\frac{1}{2} \cos \pi - \frac{1}{2} \cos 0 \right) \\
 &= -\left(-\frac{1}{2} - \frac{1}{2} \right) \\
 &= 1
 \end{aligned}$$

Example set 1.2.4

$$\begin{aligned}
 & \int_0^4 \sqrt{2x+1} \, dx \\
 &= \int_1^9 \sqrt{u} \cdot \frac{du}{2} \\
 &= \frac{1}{2} \int_1^9 u^{1/2} du \\
 &= \frac{1}{2} \left[\frac{u^{3/2}}{3/2} \right]_1^9 \\
 &= \frac{1}{2} \cdot \frac{2}{3} \left[9^{3/2} - 1^{3/2} \right] \\
 &= \frac{1}{3} [27 - 1] \\
 &= \frac{26}{3}
 \end{aligned}$$

$$\left. \begin{aligned}
 & \text{Set } u = 2x+1 \\
 & du = 2 \, dx \\
 & dx = \frac{du}{2}
 \end{aligned} \right\}$$

x	u
0	1
4	9