Formulas for Arc (Curve) Length in the Plane:

$$\textit{Arc Length for a curve } y = \mathrm{f}(x): \quad \int_a^b \sqrt{1 + \mathrm{f}\,'(x)^2}\,dx$$

$$\textit{Arc Length for a curve } x = \mathrm{g}(y): \quad \int_c^d \sqrt{1 + \mathrm{g}\,'(y)^2}\,dy$$

$$\textit{Arc Length for a parametric curve } [x, y] = [\mathrm{x}(t), \mathrm{y}(t)]: \quad \int_{t_1}^{t_2} \sqrt{\mathrm{x}\,'(t)^2 + \mathrm{y}'(t)^2}\,dt$$

Arc Length Exercises. Note that, in order to do some of the arc length exercises, you may need to solve one or more of the indefinite integral exercises first (see below).

Arc Length Exercise 2.1 : $y = \dfrac{2\,(x^2-1)^{(3/2)}}{3}$, $x = 1..3$

Arc Length Exercise 2.2 : $y = \dfrac{(x^2+2)^{(3/2)}}{3}$, $x = 0..1$

Arc Length Exercise 2.3 : $y = \ln(\sec(x))$, $x = 0..\dfrac{\pi}{4}$

Integration by Parts:

$$\begin{aligned} \mathrm{d}(u\,v) &= du\,v + dv\,u \\ \int\ d(uv) &= \int v\,du + \int u\,dv \\ \int u\,dv &= u\,v - \int v\,du \end{aligned}$$

Indefinite Integral (Antiderivative) Exercises.

Indefinite Integrals Exercise 2.1 : $\int x \sin(x)\,dx$

Indefinite Integrals Exercise 2.2 : $\int \ln(x)\,dx$

Indefinite Integrals Exercise 2.3 : $\int x\,e^x\,dx$

Indefinite Integrals Exercise 2.4 : $\int x^2\,e^x\,dx$

Indefinite Integrals Exercise 2.5 : $\int x^3\,e^x\,dx$

Indefinite Integrals Exercise 2.6 : $\int e^x \sin(x)\, dx$

Indefinite Integrals Exercise 2.7 : $\int \sec(x)\, dx$

Indefinite Integrals Exercise 2.8 : $\int \sec(x)^2\, dx$

Indefinite Integrals Exercise 2.9 : $\int \sec(x)^3\, dx$

Indefinite Integrals Exercise 2.10 : $\int x^2\, e^{(a\,x)}\, dx$