

16.2 homework

1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 33

① $\int_C y \, ds \quad x=t^2 \quad y=2t \quad 0 \leq t \leq 3$

$$\int_0^3 2t \sqrt{4t^2 + 4} \, dt = \int_0^3 4t \sqrt{t^2 + 1} \, dt$$

$$\begin{aligned} u &= t^2 + 1 \\ du &= 2t \, dt \\ 2 \, du &= 4t \, dt \end{aligned}$$

$$= 2 \int_1^{10} \sqrt{u} \, du = \frac{4}{3} \left((10)^{3/2} - (1)^{3/2} \right)$$

$$= \boxed{\frac{4}{3} (10)^{3/2} - \frac{4}{3}}$$

③ $\int_C xy^4 \, ds \quad x^2 + y^2 = 16$

$$x = 4 \cos t \quad y = 4 \sin t \quad t \in \left[-\frac{\pi}{2}, \frac{\pi}{2} \right]$$

$$\sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} = \sqrt{16} = 4$$

$$= \int_{-\pi/2}^{\pi/2} 16 \cos t (4^4 \sin^4 t) \, dt = 4^6 \int_{-\pi/2}^{\pi/2} \cos t \sin^4 t \, dt$$

$$\begin{aligned} u &= \sin t \\ du &= \cos t \, dt \\ &= 4^6 \int_1^{-1} u^4 \, du \end{aligned}$$

$$= 4^6 \left[\frac{1}{5} + \frac{1}{5} \right] =$$

$$4^6 \left(\frac{2}{5} \right) = \frac{8192}{5}$$

$$= \boxed{1638.4}$$