9. $\int 3x^3 \, dx$

$\frac{3}{4}x^4 + C$

$\frac{3x^4}{4} + C$

15. $\int \frac{3}{t^2} \, dt$ $\quad 3t^{-2}$

$\frac{3t^{-1}}{-1} = -3t^{-1}$

$-\frac{3}{t} + C$

$(2t+3)^2$

$\int 4t^2 + 12t + 9 \, dt$

$\frac{4}{3}t^3 + 6t^2 + 9t + C$

$$f''(x) = 5$$

$$f'(x) = 5x + C$$

$$f'(0) = 7 = 5(0) + C$$

$$C = 7$$

$$f'(x) = 5x + 7$$

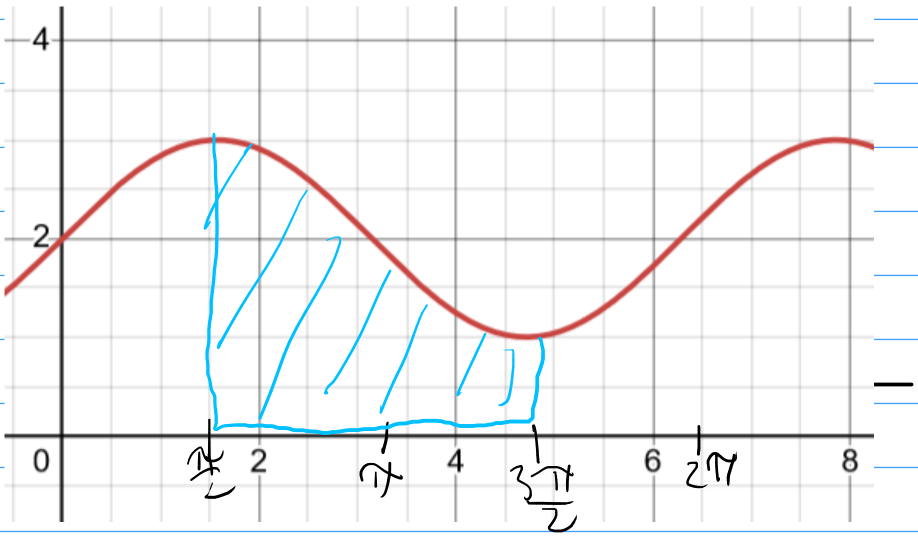
$$f(x) = \frac{5x^2}{2} + 7x + C$$

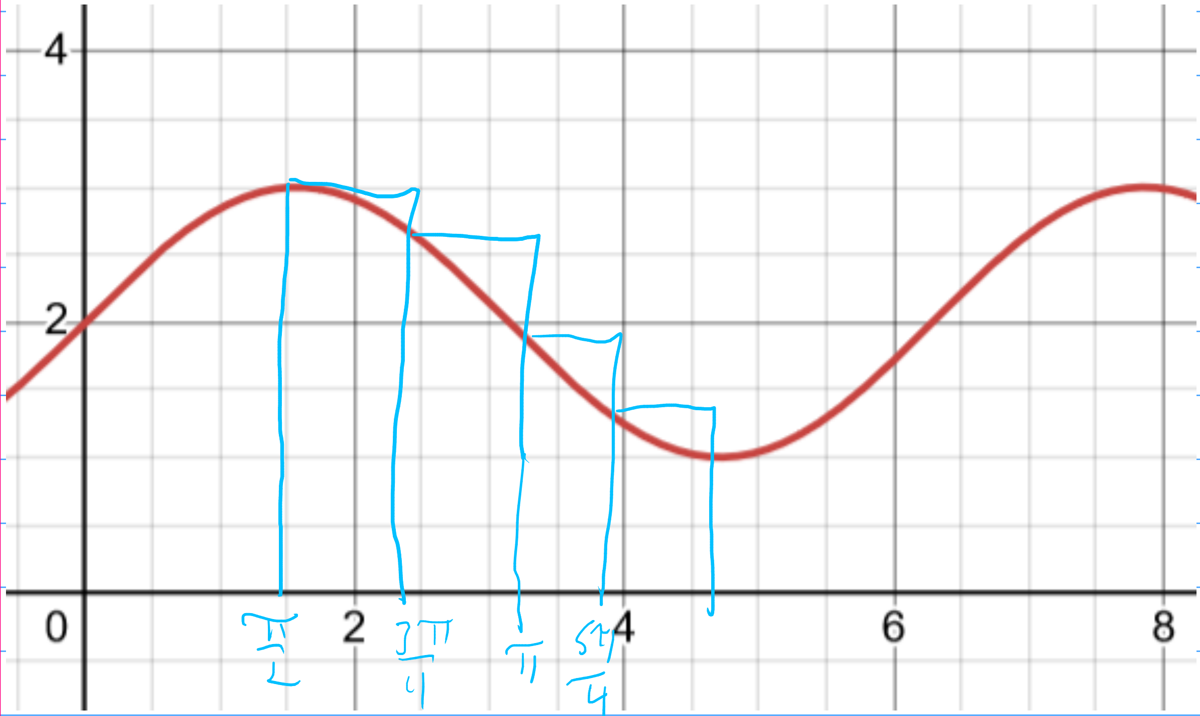
$$f(0) = \frac{5}{2}(0) + 7(0) + C = 3$$

$$C = 3$$

$$f(x) = \frac{5}{2}x^2 + 7x + 3$$

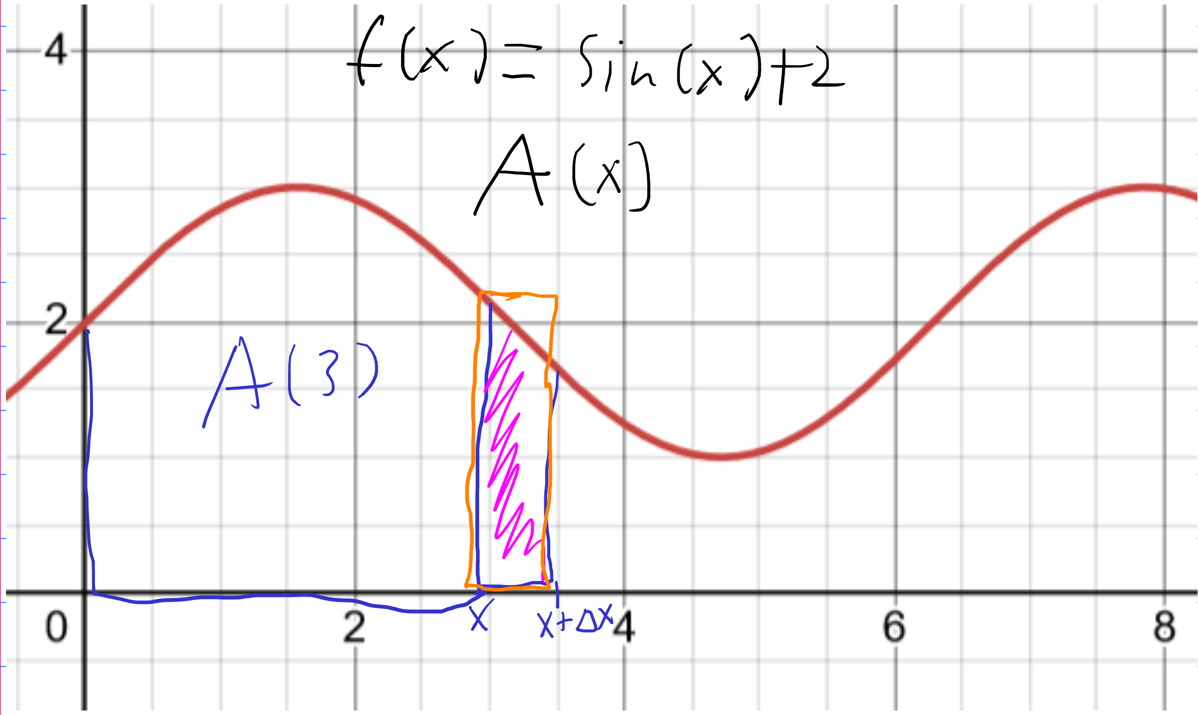
$f(x) = \sin(x) + 2$





$$f\left(\frac{\pi}{2}\right)\cdot\frac{\pi}{4} + f\left(\frac{3\pi}{4}\right)\frac{\pi}{4} + f(\pi)\frac{\pi}{4} + f\left(\frac{5\pi}{4}\right)\frac{\pi}{4}$$

Riemann sum



$$A(x+\Delta x) - A(x) \approx f(x)\Delta x$$

$$\frac{A(x+\Delta x) - A(x)}{\Delta x} \approx f(x)$$

$$\frac{A(x+h) - A(x)}{h} \approx f(x)$$

$$\lim_{h \to 0} \frac{A(x+h) - A(x)}{h} = f(x)$$

$$f(x) = \sin(x) + 2$$

$$A(0) = 0$$

$$\int f(x)\,dx = -\cos(x) + 2x + C$$

$$-\cos(0) + 2\cdot 0 + C = 0$$

$$-1 + 0 + C = 0$$

$$A(x) = -\cos(x) + 2x + 1 \quad C = 1$$

$$\int_0^3 \sin(x) + 2\,dx = -\cos(3) + 2(3) + 1$$

$$A(x) = \int_0^x \sin(x) + 2\,dx = -\cos(x) + 2x + 1$$

$$-\cos(x) + 2x + C$$

$$\int_\pi^{2\pi} \sin(x) + 2\,dx \quad -\cos(2\pi) + 2(2\pi) \cancel{+C}$$

$$-\left(-\cos(\pi) + 2(\pi) \cancel{+C}\right)$$

$$-1 + 4\pi - (1 + 2\pi) = 2\pi - 1$$

$V(t) = 3t^2 + t - 1$

how far is this at $t = 4$ from its position at $t = 2$

$$\int_2^4 V(t)\, dt$$

$$\frac{3}{3}t^3 + \frac{t^2}{2} - t + C \Big|_2^4$$

$$\left(64 + \frac{16}{2} - 4 + \cancel{C}\right) - \left(8 + \frac{4}{2} - 2 + \cancel{C}\right)$$

$$68 - 8 = 60$$

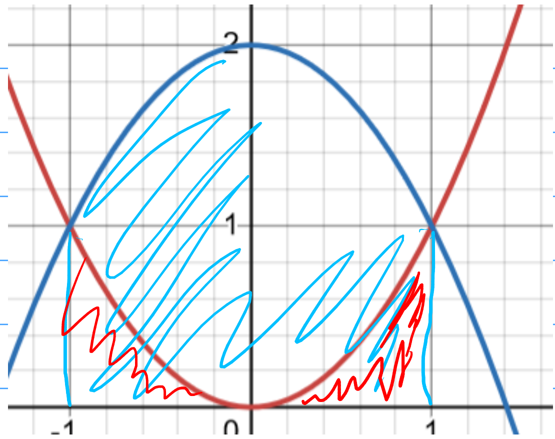
7. $\int_{-1}^{1} (x^3 - x^5)\, dx$

$$\int f(x)\, dx$$

$$\frac{x^4}{4} - \frac{x^6}{6} \Big|_{-1}^{1}$$

$$\left(\frac{1}{4} - \frac{1}{6} + \cancel{C}\right) - \left(\frac{1}{4} - \frac{1}{6} + \cancel{C}\right)$$

$$= 0$$



top: $-x^2+2$

button: x^2

$$\int_{-1}^{1} -x^2+2\,dx - \int_{-1}^{1} x^2\,dx$$

$$\frac{-x^3}{3}+2x+C\Big|_{-1}^{1}$$

$$\left(\frac{-1}{3}+2+C\right)-\left(\frac{1}{3}-2+C\right)$$

$$4+\frac{2}{3} \qquad \frac{14}{3}$$

$$\int_{-1}^{1} x^2\,dx \qquad \frac{x^3}{3}+C\Big|_{-1}^{1} \qquad \frac{1}{3}-\frac{-1}{3}=2/3$$

$$\left(4+\frac{2}{3}\right)-\left(\frac{2}{3}\right)=4$$