Definite Integral: represents the area underneath a function to the x-axis between two points.

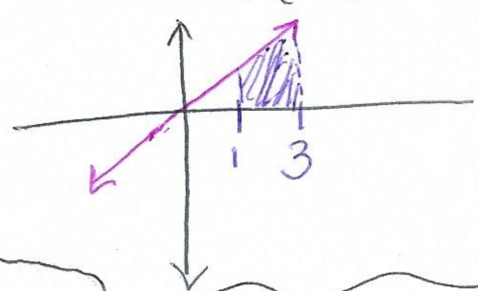
Notation:

$$\int_a^b f(x)\,dx$$

Let $F(x)$ be the antideravative of $f(x)$.

$$F(x)\Big|_a^b = F(b) - F(a)$$

visual: $f(x) = x$



ex $\int_1^3 x\,dx = \frac{x^2}{2}\Big|_1^3 = \frac{3^2}{2} - \frac{1^2}{2} = \frac{9-1}{2}\frac{8}{2}$

4 area under the function between the bounds.

1.) $\int_2^3 x^2 + 3x\,dx = \frac{x^3}{3} + \frac{3x^2}{2}\Big|_2^3$

$\frac{3^3}{3} + \frac{3(3)^2}{2} - \left[\frac{2^3}{3} + \frac{3(2)^2}{2}\right] = \frac{27}{3} + \frac{27}{2} - \frac{8}{3} - \frac{12}{2} = \frac{19}{3} + \frac{15}{2}$

$\frac{38}{6} + \frac{45}{6} = \boxed{\frac{83}{6}} = \boxed{13\frac{5}{6}}$

2.) $\int_4^9 \sqrt{x}\,dx = \frac{2x^{3/2}}{3}\Big|_4^9$ $\quad \frac{2(9)^{3/2}}{3} - \frac{2(4)^{3/2}}{3} = \frac{2\cdot 3^{\cancel{3}2}}{\cancel{3}} - \frac{2\cdot 2^3}{3} = \frac{18}{1} - \frac{16}{3}$

$= \frac{54}{3} - \frac{16}{3} = \boxed{\frac{38}{3}}$

3) $\int_1^2 3x^2+4x-1\,dx = x^3+2x^2-x \Big|_1^2$

$2^3+2\cdot2^2-2-[1^3+2(1)^2-1] = 8+8-2-1-2+1 = \boxed{12}$

4) $f''(x)=10, \quad f'(1)=7 \quad f(2)=12 \quad f(x)=?$

$\int 10\,dx = 10x+C$

$7=10(1)+C$

$-3=C$

$f'(x)=10x-3$

$\int 10x-3 = 5x^2-3x+C$

$12=5(2)^2-3(2)+C$

$12=5(4)-6+C$

$12=20-6+C$

$12=14+C$

$-2=C$

$\boxed{f(x)=5x^2-3x-2}$

5) $\int_2^4 x^2-2x+4\,dx = \frac{x^3}{3}-x^2+4x \Big|_2^4$

$\frac{4^3}{3}-4^2+4\cdot4-\frac{2^3}{3}+2^2-4\cdot2$

$\frac{64}{3}\cancel{-16+16}^{0}-\frac{8}{3}+\cancel{4-8}^{-4}$

$\frac{56}{3}-\frac{4}{1}$

$\frac{56}{3}-\frac{12}{3}=\frac{44}{3}$