The first fundamental thm. of Calculus tells you $\int_a^b f(x)\,dx = \_\_\_$

First Fundamental Thm of Calculus:

$$\int_a^b f(x)\,dx = F(b) - F(a)$$

$\int_1^9 \sqrt{x}\,dx =$

$$\int_1^9 \sqrt{x}\,dx$$

$$\underbrace{\int \sqrt{x}\,dx = \frac{2}{3}x^{3/2} + C}_{\text{Indefinite!}}$$

$$\int_1^9 x^{1/2}\,dx$$

$$\frac{2}{3}\cdot x^{3/2}\Big|_1^9$$

take antiderivative

$$\frac{2}{3}(\sqrt{9})^3 - \frac{2}{3}(\sqrt{1})^3$$

Upper limit - lower limit (FTC)

$$\frac{2}{3}\cdot 27 - \frac{2}{3}\cdot 1$$

I do not simplify because you have common denominator

$$\frac{54}{3} - \frac{2}{3} = \frac{52}{3}$$

$\int_2^3 \frac{1}{x} f(x)\,dx$

$\boxed{\text{And}}$

$\int_2^3 \frac{1}{x^2} f(x)\,dx$

$$\int_2^3 \frac{1}{x}\,dx = \ln|x|\Big|_2^3$$
$$= \ln(3) - \ln(2)$$
$$= \ln\left(\frac{3}{2}\right)$$

Remember:

$\ln(ab) = \ln a + \ln b$

$\ln\left(\frac{a}{b}\right) = \ln a - \ln b$

$\ln a^b = b\cdot\ln a$

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

$$= \frac{-1}{x}\Big|_2^3 = \frac{-1\cdot 2}{3\cdot 2} - \frac{-1\cdot 3}{2\cdot 3} = \frac{-2}{6} + \frac{3}{6} = \frac{1}{6}$$