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$$I = \int_1^{10} (3x^3 + 2x^2 + 24x + 1)\,dx$$

where
$a = 3$
$b = 2$
$c = 24$
$d = 1$

$$= \int_1^{10} 3x^3\,dx + \int_1^{10} 2x^2\,dx + \int_1^{10} 24x + \int_1^{10} dx$$

$$= 3\left[\frac{x^4}{4}\right]_1^{10} + 2\left[\frac{x^3}{3}\right]_1^{10} + 24\left[\frac{x^2}{2}\right]_1^{10} + \left[x\right]_1^{10}$$

$$= 3\left(\frac{10^4 - 1}{4}\right) + 2\left(\frac{10^3 - 1}{3}\right) + 24\left(\frac{10^2 - 1}{2}\right) + (10 - 1)$$

$$= 7500 - 0.75 + 666.67 - 0.67 + 1200 - 12 + 9$$

$$= 9376.67 - 14.2 = 9362.25$$

$\therefore I_{analytical} = 9362.25$