



FORMULAS YOU MUST KNOW

$$\int \frac{1}{ax+b} dx = \frac{1}{a} \ln |ax+b| + C$$

$$\int \frac{1}{(ax+b)^n} dx = \frac{-1}{a(n-1)(ax+b)^{n-1}} + C$$

$$\frac{1}{(x-a)(x-b)} = \frac{1}{a-b} \left(\frac{1}{x-a} - \frac{1}{x-b} \right)$$

$$\int \frac{1}{x^2+a^2} dx = \frac{1}{a} \arctan \frac{x}{a} + C \quad (\text{not a PF integral})$$

$$\frac{f}{(ax+b)(cx+d)^2} \equiv \frac{A}{ax+b} + \frac{B}{cx+d} + \frac{C}{(cx+d)^2}$$

$$\int \frac{1}{(ax+b)^2} dx = \frac{-1}{a(ax+b)} + C$$

$$\frac{1}{P(N-P)} = \frac{1}{N} \left(\frac{1}{P} + \frac{1}{N-P} \right)$$

$$\frac{1}{(ax+b)^2} - \text{never a } \ln \text{ term}$$

$$\frac{f(x)}{(ax+b)(cx+d)} \equiv \frac{A}{ax+b} + \frac{B}{cx+d}$$

$$\frac{dP}{dt} = kP \left(1 - \frac{P}{N} \right)$$

KEY METHODS

- Cover-up is the fastest method for distinct linear factors — sub the root of each factor and read off the constant in one step. No simultaneous equations needed.
- After decomposing, add the fractions back to verify. Takes 30 seconds and catches all sign errors before you integrate.
- The logistic DE is the most common exam application of partial fractions. Know the identity $\frac{1}{P(N-P)} = \frac{1}{N} \left(\frac{1}{P} + \frac{1}{N-P} \right)$ by heart.

EXAM TRAPS TO AVOID

- If $\deg(\text{num}) \geq \deg(\text{den})$, you must do polynomial long division first before setting up the PF decomposition. Students who skip this step get the wrong form entirely.
- $\int \frac{1}{k-x} dx = -\ln |k-x| + C$ — the minus sign from the chain rule is the most commonly dropped mark in PF integration.