Integrated Forms of Common Rate Laws for R $\rightarrow$ P

	Zero-Order Reaction	First-Order Reaction	Second-Order Reaction
The Rate Law	Rate = k	Rate = k[R]	Rate = $k[\mathrm{R}]^2$
The Differential Form of the Rate Law	$-\frac{d[\mathrm{R}]}{dt} = k$	$-\frac{d[\mathrm{R}]}{dt} = k[\mathrm{R}]$	$-\frac{d[\mathrm{R}]}{dt} = k[\mathrm{R}]^2$
The Integrated Form of the Rate Law and its Derivation (Last equation is linear form for plotting)	$d[\mathrm{R}] = -kdt$ $\int d[\mathrm{R}] = -k\int dt$ $[\mathrm{R}]_t - [\mathrm{R}]_o = -kt$ $[\mathrm{R}]_t = [\mathrm{R}]_o - kt$	$\frac{1}{[\mathrm{R}]}d[\mathrm{R}] = -kdt$ $\int \frac{1}{[\mathrm{R}]}d[\mathrm{R}] = -k\int dt$ $\ln[\mathrm{R}]_t - \ln[\mathrm{R}]_o = -kt$ $\ln[\mathrm{R}]_t = \ln[\mathrm{R}]_o - kt$	$\frac{1}{[\mathrm{R}]^2}d[\mathrm{R}] = -kdt$ $\int \frac{1}{[\mathrm{R}]^2}d[\mathrm{R}] = -k\int dt$ $-\frac{1}{[\mathrm{R}]_t} + \frac{1}{[\mathrm{R}]_o} = -kt$ $\frac{1}{[\mathrm{R}]_t} = \frac{1}{[\mathrm{R}]_o} + kt$
What to Plot and How to Interpret	A plot of $[\mathrm{R}]_t$ vs. time is linear with a slope of $-k$ and a y-intercept of $[\mathrm{R}]_o$	A plot of $\ln[\mathrm{R}]_t$ vs. time is linear with a slope of $-k$ and a y-intercept of $\ln[\mathrm{R}]_o$	A plot of $[\mathrm{R}]^{-1}$ vs. time is linear with a slope of k and a y-intercept of $[\mathrm{R}]_o^{-1}$

See Chapter 14A.1 (661 – 662) for the textbook's discussion of this same topic. You are not responsible for these derivations; you are, however, responsible for knowing the linear forms of the integrated rate laws and how to use them to (i) determine a reaction's rate law; and (ii) to determine values for a reaction's rate constant and the initial concentration of reactant. Study them!