

Quiz Key

$$1. \int 7e^{3x} dx = 7 \int e^{3x} dx$$

$$u = 3x, \quad du = 3dx, \quad dx = \frac{du}{3}$$

$$7 \int \frac{e^u}{3} du = \frac{7}{3} e^u + C = \frac{7}{3} e^{3x} + C$$

$$2. \int (3x^2 - 2x + 1)(-x^3 + x^2 - x + 4) dx$$

$u = \text{this}$

$$du = -3x^2 + 2x - 1 dx$$

$$-du = (3x^2 + 2x - 1) dx$$

$$\int -u du = - \int u du = -\frac{u^2}{2} + C$$

$$= -\frac{(-x^3 + x^2 - x + 4)^2}{2} + C$$

$$3. \int \frac{\ln(x-7)}{2x-14} dx = \frac{1}{2} \int \frac{\ln(x-7)}{(x-7)} dx$$

$$u = \ln(x-7)$$

$$\frac{du}{dx} = \frac{1}{x-7} \rightarrow dx = \frac{du}{x-7}$$

$$\frac{1}{2} \int u du = \frac{1}{2} \left(\frac{u^2}{2} + C \right) = \frac{1}{4} [\ln(x-7)]^2 + C$$

$$4. \int x^2 \ln x \, dx$$

$$u = \ln x$$

$$\int dv = \int x^2 \, dx$$

$$du = \frac{dx}{x}$$

$$v = \frac{x^3}{3}$$

$$\int u \, dv = uv - \int v \, du$$

$$= \frac{x^3 \ln x}{3} - \int \frac{x^3}{3} \cdot \frac{dx}{x}$$

$$= \frac{x^3 \ln x}{3} - \int \frac{x^2}{3} \, dx$$

$$= \left[\frac{x^3 \ln x}{3} - \frac{x^3}{9} + C \right]$$

~~$$\int \frac{d}{dx} \ln x \, dx$$~~