U-SUBSTITUTION

1. $\int (u)^{POWER}$

2. $\int \sqrt{u}$

3. $\int \dfrac{}{u}$

4. $\int e^u$

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1. $\int \dfrac{5}{(x-3)^3} dx$

$u = x - 3 \quad du = 1 \cdot dx$

$= 5 \int \dfrac{1}{u^3} du$

$= 5 \int u^{-3} du$

$= 5 \left[\dfrac{u^{-3+1}}{-3+1} \right] + C$

$= 5 \left[\dfrac{u^{-2}}{-2} \right] + C$

$= 5 \left[\dfrac{1}{-2u^2} \right] + C$

$= \dfrac{-5}{2u^2} + C$

$= \dfrac{-5}{2(x-3)^2} + C$

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2. $\int x \sqrt{8x^2 - 3} \, dx$

$u = 8x^2 - 3 \quad du = 16x \, dx$

$\dfrac{1}{16} \int 16x \sqrt{8x^2 - 3} \, dx$

$\dfrac{1}{16} \int \sqrt{u} \, du$

$\dfrac{1}{16} \int u^{\frac{1}{2}} du$

$\dfrac{1}{16} \cdot \dfrac{u^{\frac{1}{2}+1}}{\frac{1}{2}+1} + C$

$\dfrac{1}{16} \cdot \dfrac{u^{3/2}}{\frac{3}{2}} + C$

$\dfrac{1}{16} \cdot \dfrac{2}{3} u^{\frac{3}{2}} + C$

$\dfrac{1}{24} (8x^2 - 3)^{\frac{3}{2}} + C$

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3. $\int \dfrac{x-4}{\sqrt[3]{x^2 - 8x + 1}} \, dx$

$u = x^2 - 8x + 1 \quad du = (2x - 8) \, dx$

$\qquad\qquad\qquad\quad du = 2(x-4) \, dx$

$= \dfrac{1}{2} \int \dfrac{2(x-4)}{\sqrt[3]{x^2 - 8x + 1}} \, dx$

$= \dfrac{1}{2} \int \dfrac{1}{\sqrt[3]{u}} \, du$

$= \dfrac{1}{2} \int \dfrac{1}{u^{1/3}} \, du$

$= \dfrac{1}{2} \int u^{-\frac{1}{3}} \, du$

$= \dfrac{1}{2} \cdot \dfrac{u^{-\frac{1}{3}+1}}{-\frac{1}{3}+1} + C$

$= \dfrac{1}{2} \cdot \dfrac{u^{2/3}}{\frac{2}{3}} + C$

$= \dfrac{1}{2} \cdot \dfrac{3}{2} u^{2/3} + C$

$= \dfrac{3}{4} (x^2 - 8x + 1)^{2/3} + C$