

Rewrite each definite integral in terms of u and du

$$1. \int_{x=0}^{x=1} (5x+4)^5 dx \quad \text{Let } u = 5x+4$$

$u(0) = 4$
 $u(1) = 9$

$$\frac{du}{dx} = 5 \quad du = 5 dx$$

$$\frac{du}{5} = dx$$

$$\int_4^9 u^5 \frac{du}{5} = \left[\frac{1}{5} u^6 \right]_4^9$$

$$2. \int_0^2 3x^2(x^3 + 4)^5 dx \quad \text{Let } u = x^3 + 4$$

$u(0) = 4$
 $u(2) = 12$

$$\frac{du}{dx} = 3x^2 \quad du = 3x^2 dx$$

$$\int_4^{12} 3x^2(u^5) dx$$

$$\int_4^{12} \frac{du}{dx} (u^5) dx = \int_4^{12} u^5 du$$

$$= \left[\frac{1}{6} u^6 \right]_4^{12}$$

3. $\int_1^3 \cos(2x+1) dx$ Let $u = 2x + 1 \rightarrow \frac{du}{dx} = 2$
 $\frac{du}{2} = dx$

$$\int_3^7 \cos(u) du$$

$$\int_3^7 \cos(u) \frac{du}{2} = \frac{1}{2} \int_3^7 \cos(u) du$$

- (1) Change upper/lower limit
 - (2) Substitute what you know
 - (3) Take the derivative of u
 - (4) solve $\frac{du}{dx}$ for dx
 - (5) Substitute in for dx
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4. $\int_0^{\pi/4} \frac{\sin x}{(\cos x)^5} dx$ Let $u = \cos x \rightarrow \frac{du}{dx} = -\sin x$
 $\frac{du}{-\sin x} = dx$

$$\int_1^{1/2} \frac{\sin x}{u^5} dx$$

$$\int_1^{1/2} \frac{\sin x}{u^5} \cdot \frac{du}{-\sin x} = \int_1^{1/2} \frac{-1}{u^5} du = \boxed{\int_1^{1/2} -u^{-5} du}$$