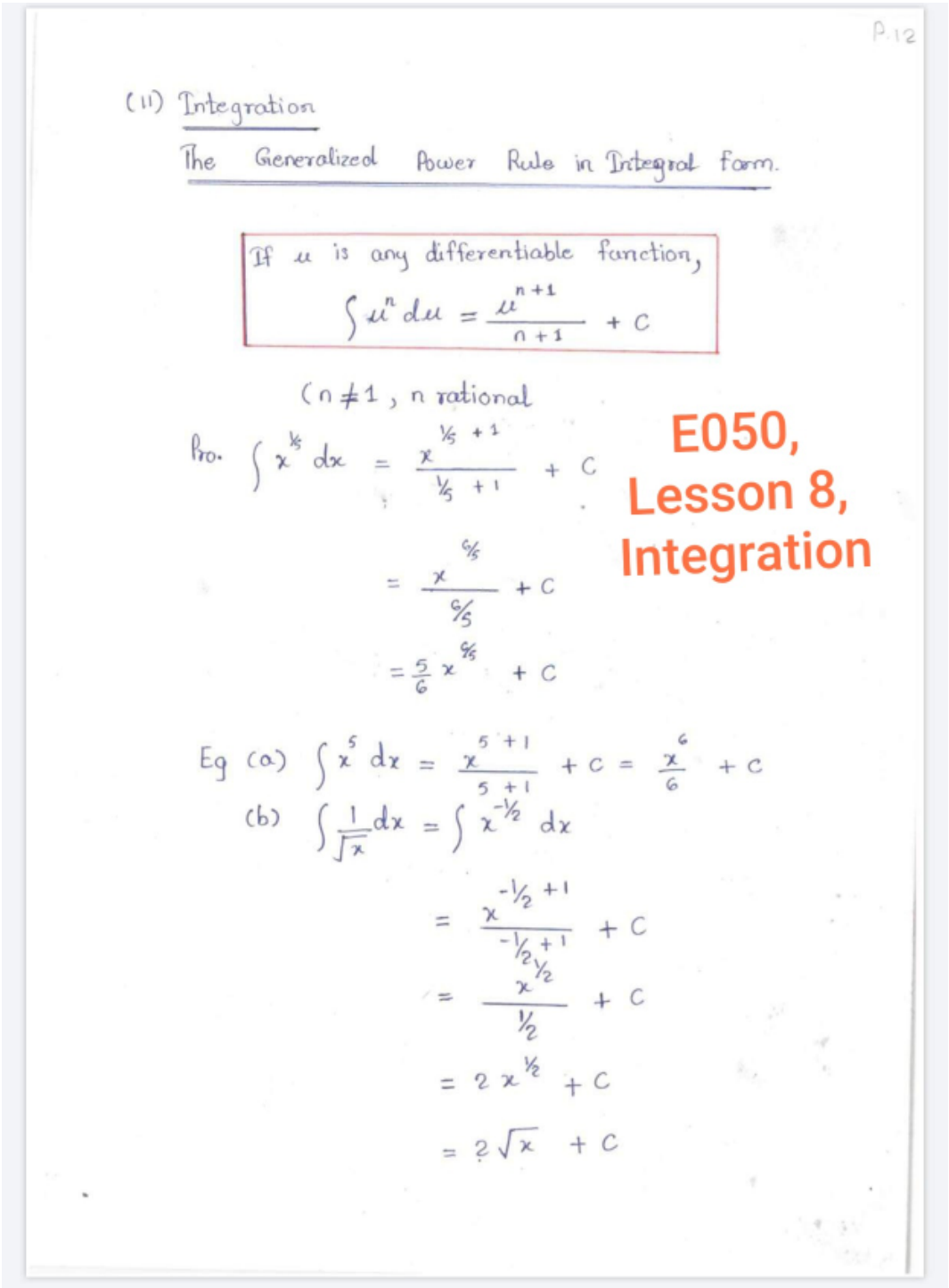
E050, Lesson 8, Integration



P.12

(11) Integration

The Generalized Power Rule in Integral form.

If u is any differentiable function,

$$\int u^n \, du = \frac{u^{n+1}}{n+1} + C$$

$(n \neq 1$, n rational

Pro. $\int x^{1/5} \, dx = \frac{x^{1/5+1}}{1/5+1} + C$

$= \frac{x^{6/5}}{6/5} + C$

$= \frac{5}{6} x^{6/5} + C$

Eg (a) $\int x^5 \, dx = \frac{x^{5+1}}{5+1} + C = \frac{x^6}{6} + C$

(b) $\int \frac{1}{\sqrt{x}} dx = \int x^{-1/2} \, dx$

$= \frac{x^{-1/2+1}}{-1/2+1} + C$

$= \frac{x^{1/2}}{1/2} + C$

$= 2x^{1/2} + C$

$= 2\sqrt{x} + C$

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Evaluate $\int (x+2)^5 \, dx$

$\int u^n \, dx$ (we can put the integral in the form)

by substituting

$$u = x+2, \quad du = d(x+2) = \frac{d}{dx}(x+2) \cdot dx$$

$$= 1 \cdot dx$$

$$= dx$$

Then

$$\int (x+2)^5 \, dx = \int u^5 \, du$$

$$= \frac{u^{5+1}}{5+1} + C$$

$$= \frac{(x+2)^6}{6} + C$$

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