C) If some roots are of the second degree and not analytical, then the numerator is straight linear equation:

$$\int \text{البسط} = \int \frac{AX+B}{X^2+a}$$

For example

1. $\int \frac{X^2+2X}{X(X^2+1)} dx$

$$\int \frac{X^2+2X}{X(X^2+1)} dx = \int \frac{A}{X} dx + \int \frac{BX+C}{X^2+1} dx$$

$$\left(\frac{X^2+2X}{X(X^2+1)} = \frac{A}{X} + \frac{BX+C}{X^2+1} \right) \times X(X^2+1)$$

$$X^2+2X = A(X^2+1) + (BX+C)X$$
$$X^2+2X = AX^2 + A + BX^2 + CX$$

$X^2 = AX^2 + BX^2$ ① $\div X^2 \Rightarrow 1 = A+B$

$2X = CX$ ② $\div X \Rightarrow C = 2$

$0 = A$ ③ $\Rightarrow B = 1$

$$\therefore \int \frac{X^2+2X}{X(X^2+1)} dx = \int \frac{X+2}{X^2+2} dx$$

$$= \int \frac{X}{X^2+1} dx + \int \frac{2}{X^2+1} dx$$

$$= 2\ln|X^2+1| + 2\tan^{-1}X + c$$

2. $\int \frac{1}{x^2(x^2+4)}\,dx$;(x^2+4) is not able analytical

$\therefore \int \frac{1}{x^2(x^2+4)}\,dx = \int \frac{A}{x}\,dx + \int \frac{B}{x^2}\,dx + \int \frac{Cx+D}{x^2+4}\,dx$

$$\left(\frac{1}{x^2(x^2+4)} = \frac{A}{x} + \frac{B}{x^2} + \frac{Cx+D}{x^2+4} \right) * x^2(x^2+4)$$

$$1 = Ax(x^2+4) + B(x^2+4) + (Cx+D)x^2$$
$$1 = Ax^3 + 4Ax + Bx^2 + 4B + Cx^3 + Dx^2$$

$Ax^3 + Cx^3 = 0$ ① $\Rightarrow A = -C$
$Bx^2 + Dx^2 = 0$ ② $\Rightarrow B = -D$
$4Ax = 0$ ③ $\Rightarrow A = 0 \Rightarrow C = 0$
$4B = 1$ ④ $\Rightarrow B = \frac{1}{4}$; $D = -\frac{1}{4}$

$$\therefore \int \frac{1}{x^2(x^2+4)}\,dx = \int \frac{\frac{1}{4}}{x^2}\,dx - \int \frac{\frac{1}{4}}{x^2+4}\,dx$$

$$= \frac{1}{4}\int x^{-2}\,dx - \frac{1}{4}\int \frac{1}{x^2+4}\,dx$$

$$= \frac{1}{4}\,\frac{1}{x} - \frac{1}{4}\cdot\frac{1}{2}\tan^{-1}\frac{x}{2} + c$$

$$= \frac{1}{4x} - \frac{1}{8}\tan^{-1}\frac{x}{2} + c$$