Subject سؤال حلزونة موضوع الدرس

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ex (٤) Solve $yp^2(1+x^2) = x^2 q$

$$\frac{p^2(1+x^2)}{x^2} = \frac{q}{y} = a$$

$$\Rightarrow \frac{p^2(1+x^2)}{x^2} = a \Rightarrow p^2(1+x^2) = x^2 a$$

$$\Rightarrow p^2 = \frac{x^2 a}{1+x^2}$$

$$\Rightarrow p = \frac{x\sqrt{a}}{\sqrt{1+x^2}} \quad , F_1$$

$$\frac{q}{y} = a \Rightarrow q = ay \quad , F_2$$

$$z = \frac{1}{2}\int \sqrt{a}\, 2x (1+x^2)^{-\frac{1}{2}} dx + \int ay\, dy$$

$$= \frac{\sqrt{a}}{2} 2 (1+x^2)^{\frac{1}{2}} + a\frac{y^2}{2} + C$$

$$= \sqrt{a}\,(1+x^2)^{\frac{1}{2}} + a\frac{y^2}{2} + C$$

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Case (4) $f(x, p, q) = 0$

let $q = a$, $p = \phi(x, a)$

$\therefore dz = p\,dx + q\,dy$

$\therefore z = \int \phi(x, a)\,dx + \int a\,dy$

ex $2x^3pq + p = x^2$

let $q = a \Rightarrow 2x^3ap + p = x^2$

$\Rightarrow p(2x^3a + 1) = x^2$

$\Rightarrow p = \frac{x^2}{1 + 2x^3a}$

$$\int dz = \frac{1}{6a} \int \frac{6ax^2}{1 + 2x^3a}\,dx + \int a \cdot dy$$

$$z = \frac{1}{6a} \ln|1 + 2x^3a| + ay + C$$