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Equation of a Curve given $f'(x)$ | Past Paper Question | P1 CIE June 2013 Q9(iii)

A curve has equation $y = f(x)$ and is such that $f'(x) = 3x^{\frac{1}{2}} + 3x^{-\frac{1}{2}} - 10$.

(iii) It is given that the curve $y = f(x)$ passes through the point $(4, -7)$. Find $f(x)$. [4]

$$f(x) = \int (3x^{\frac{1}{2}} + 3x^{-\frac{1}{2}} - 10) dx$$

$$= \frac{3x^{\frac{3}{2}}}{\frac{3}{2}} + \frac{3x^{\frac{1}{2}}}{\frac{1}{2}} - 10x + c$$

$$= 2x^{\frac{3}{2}} + 6x^{\frac{1}{2}} - 10x + c$$

Now $f(4) = -7$

$$\therefore 2(4)^{\frac{3}{2}} + 6(4)^{\frac{1}{2}} - 10(4) + c = -7$$

$$\therefore 16 + 12 - 40 + c = -7$$

$$\therefore -12 + c = -7$$

$$\therefore c = 5$$

$$\therefore f(x) = 2x^{\frac{3}{2}} + 6x^{\frac{1}{2}} - 10x + 5$$

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