NAME : MUSTAPHA YAHAYA DANJUMA
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Calculus

1. $y = \frac{[(x+1)^2 (x-2)^{1/2}]}{[(2x-1)(x+3)^{3/2}}$

2. $y = \frac{[3e^x \sin 2x)}{[x^{5/2}]}$

Integrate the following with respect of the variable

1. $4\sec^2(3m+1)$
2. $2t(3t^2-1)^{1/2}$
3. $\frac{2x}{(4x^2-1)^{1/2}}$

Solution

1 Calculus

$$y = \frac{[(x+1)^2 (x-2)^{1/2}]}{[(2x-1)(x+3)^{3/2}]}$$

$$y = \frac{(x^2-1)}{(2x^2+2)^{3/2}}$$

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since standard form $= ax^n$

then $y = \frac{x-1}{x+1} = \frac{x}{(x)^3}$

$y = 3x^{-2}$

where $a = 3$ and $n = -2$

$\therefore \frac{dy}{dx} = (3)(-2)x^{-2-1}$

$= -6x^3 = -\frac{6}{x^3}$

2 $y = \frac{3e^x \times \sin(2x)}{x^{5/2}}$

finding the derivative of the function

$$y = \frac{d}{dx}\left(\frac{3e^x \times \sin(2x)}{x^{5/2}}\right)$$

using differentiation rule

$$\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{\frac{d}{dx}(f)g - f \times \frac{d}{dx}(g)}{g^2}$$

$$\therefore y = \frac{d}{dx}\left(\frac{(3e^x \times \sin(2x)) \times x^{5/2} - 3e^x \times \sin(2x) \times \frac{d}{dx}(5/2)}{\left(x^{5/2}\right)^2}\right)$$

derivative of the product =

$$y = \frac{\left(3e^x \times \sin(2x) + 3e^x \times \cos(2x) \times 2\right) x^{5/2} - 3e^x \times \sin(2x) \times \frac{d}{dx}\left(x^{5/2}\right)}{\left(x^{5/2}\right)}$$

$$\therefore y = \frac{6x^2\sqrt{x}e^x \times \sin(2x) + 12x^2\sqrt{x}e^x \times \cos(2x) - 15\sqrt{x}e^x \times \sin(2x) \times x}{2x^5}$$

Integration

1 $4\sec^2(3m+1)$

in exponential form

$= 2^2 \times \sec(3m+1)^2$

multiply through

$= (2\sec(3m+1))^2$

2 $2t(3t^2-1)^{1/2}$

Using symplification method

$= a^{\frac{m}{n}} = \sqrt[n]{a^m}$

$\therefore 2t\sqrt{3t^2-1}$

c)

3 $\dfrac{2x}{(4x^2-1)^{1/2}}$

$= \dfrac{2x}{\frac{(4x^2-1)^1}{2}}$

using complex fraction

$= \dfrac{x}{4x^2-1}$