Tecnológico de Monterrey Preparatoria

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Activity 5.2: Change of variable 2 – Double Substitution

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Solve the integrals

1) $\int 2x\sqrt{x+2}\,dx$ $\frac{4(x+2)^{5/2}}{5} - \frac{8(x+2)^{3/2}}{3} + C$

2) $\int \frac{8e^{2x}}{5-3e^{2x}}dx$ $-\frac{4}{3}\ln|5-3e^{2x}| + C$

3) $\int \frac{6Ln\sqrt{x}}{x}dx$ $6(\ln\sqrt{x})^2 + C$

4) $\int 15x^2(3x+2)^5\,dx$ $5\left[\frac{(3x+2)^8}{72} - \frac{(3x+2)^7}{63} + \frac{(3x+2)^6}{54}\right] + C$

5) $\int \frac{x^2}{(5-3x)^4}dx$ $-\frac{1}{3}\left[\frac{1}{-9(5-3x)} + \frac{10}{18(5-3x)^2} - \frac{25}{27(5-3x)^3}\right] + C$

6) $\int \frac{12x^2}{(4-x^3)^5}dx$ $\frac{1}{(4-x^3)^4} + C$

7) $\int \frac{4x}{1-2x}dx$ $\frac{4}{-2}\left[\frac{\ln|1-2x|}{2} - \frac{1-2x}{2}\right] + C$

8) $\int 8x^3(2-x^2)^9\,dx$ $-4\left[\frac{(2-x^2)^{10}}{5} - \frac{(2-x^2)^{11}}{11}\right.$

9) $\int_{-4}^{-2} \frac{x}{(2-5x)^3}dx$ $-\frac{23}{17424} = -.0013$

10) $\int (2x+1)(2-x)^5\,dx$ $-\frac{2(2-x)^7}{7} + \frac{5(2-x)^6}{6} + C$

11) $\int 6x^2\cdot\sqrt[3]{7+3x}\,dx$ $\frac{(7+3x)^{10/3}}{15} - \frac{4(7+3x)^{7/3}}{3} + \frac{49(7+3x)^{4/3}}{6} + C$

12) $\int_{-2}^{2} 3x\sqrt{2x+5}\,dx$ $\frac{38}{5} = 7.6$

13) $\int_0^2 \frac{2x\,dx}{(3x+4)^3}$ $\frac{1}{100}$

14) $\int_1^2 (x-1)\sqrt{2-x}\,dx$ $\frac{4}{15} = .26$

15) The acceleration of an object is given by $a(t)=12t\sqrt{2t+1}$ in m²/sec. Find the equation of velocity in m/sec if the initial velocity of the object (t = 0) is 20 m/sec

$v(t) = \frac{6}{5}(2t+1)^{5/2} - 2(2t+1)^{3/2} + 20.8$

16) The equation of acceleration of an object is given by $a(t)=\frac{40t}{(1+2t)^3}$ in ft/min². Determine the equation of velocity if we know that after 5 min the velocity is 15 ft/min?

$v(t) = -\frac{10}{1+2t} + \frac{5}{(1+2t)^2} + \frac{1920}{121}$

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It helped us to understand and to see that not all integrals will be so easy and direct, and that sometimes we will need to do an extra step.