

Assignment 10 (SOLUTION from Textbook Manual Solution)

Text: Calculus for the Life Sciences, S. Schreiber, K. Smith and W. Getz, Wiley, 2014

Section 5.5

6. a. We obtain that $\int x(3x^2 - 5) dx = \int 3x^3 - 5x dx = (3/4)x^4 - (5/2)x^2 + C.$

b. Using the substitution $u = 3x^2 - 5$, $du = 6x dx$ and we obtain $\int x(3x^2 - 5)^5 dx = \int u^5/6 du = u^6/36 + C = (3x^2 - 5)^6/36 + C.$

7. a. We obtain that $\int x^2\sqrt{2x^3} dx = \int \sqrt{2}x^{7/2} dx = \sqrt{2}(2/9)x^{9/2} + C.$

b. We substitute $u = 2x^3 - 5$, $du = 6x^2 dx$ and we obtain $\int 6x^2\sqrt{2x^3 - 5} dx = \int u^{1/2} du = 2u^{3/2}/3 + C = 2(2x^3 - 5)^{3/2}/3 + C.$

9. Let $u = 2x + 3$, then $du = 2dx$ and $\int (2x + 3)^4 dx = \int (1/2)u^4 du = (1/10)u^5 + C = (1/10)(2x + 3)^5 + C.$

10. Let $u = 5x - 2$, then $du = 5dx$ and $\int (5x - 2)^{20} dx = \int (1/5)u^{20} du = (1/105)u^{21} + C = (1/105)(5x - 2)^{21} + C.$

11. Let $u = x^2 + 4$, then $du = 2x dx$ and $\int x\sqrt{x^2 + 4} dx = \int (1/2)\sqrt{u} du = (1/3)u^{3/2} + C = (1/3)(x^2 + 4)^{3/2} + C.$

12. Let $u = x^2 + 1$, then $du = 2x dx$ and $\int (x/\sqrt{x^2 + 1}) dx = \int (1/2)u^{-1/2} du = u^{1/2} + C = (x^2 + 1)^{1/2} + C.$

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14. Let $u = \sin t$, then $du = \cos t dt$ and
$$\int \sin^3 t \cos t dt = \int u^3 du = u^4/4 + C = (1/4)\sin^4 t + C.$$

15. Let $u = \ln x$, then $du = (1/x)dx$ and
$$\int (\ln x/x) dx = \int u du = u^2/2 + C = (1/2)\ln^2 x + C.$$

16. Let $u = z^4 + 12$, then $du = 4z^3 dz$ and
$$\int (z^3/\sqrt{z^4 + 12}) dz = \int (1/4)u^{-1/2} du = (1/2)u^{1/2} + C = (1/2)(z^4 + 12)^{1/2} + C.$$

29. We get that $F(t) = \int 10e^{0.3t} dt = (10/0.3)e^{0.3t} + C$; also, $10 = F(0) = 100/3 + C$, thus $C = 10 - 100/3$. This means that one day from now we will have $F(24) = (100/3)e^{0.3 \cdot 24} + 10 - 100/3 \approx 44624$ dust mites.