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Pg. 442 #15, 31, 43-51 eoo, 63, 67, 69, 82, 87

15. $\int x^4 e^{x^5} dx$

$$u = x^5 \quad (1)$$

$$\frac{du}{dx} = 5x^4 \quad (2)$$

$$du = 5x^4 dx \quad (3)$$

$$\frac{1}{5} du = x^4 dx \quad (4)$$

$$\int x^4 e^{x^5} = \int e^u \cdot \frac{1}{5} du \quad (5)$$

$$= \frac{1}{5} e^u + C \quad (6)$$

$$= \frac{1}{5} e^{x^5} + C \quad (7)$$

31. $\int \frac{(\ln x)^2}{x} dx$

$$u = \ln x \quad (8)$$

$$\frac{du}{dx} = \frac{1}{x} \quad (9)$$

$$du = \frac{1}{x} dx \quad (10)$$

$$\int \frac{(\ln x)^2}{x} dx = \int u^2 du \quad (11)$$

$$= \frac{u^3}{3} + C \quad (12)$$

$$= \frac{(\ln x)^3}{3} + C \quad (13)$$

$$43. \int_0^1 2xe^{x^2} dx$$

$$u = x^2 \quad (14)$$

$$\frac{du}{dx} = 2x \quad (15)$$

$$du = 2x dx \quad (16)$$

$$\int_0^1 2xe^{x^2} dx = \int_0^1 e^u du \quad (17)$$

$$= e^u \Big|_0^1 \quad (18)$$

$$= e^{x^2} \Big|_0^1 \quad (19)$$

$$= \left(\left(e^{(1)^2} \right) - \left(e^{(0)^2} \right) \right) \quad (20)$$

$$= e - 1 \quad (21)$$

$$47. \int_0^4 \frac{dt}{1+t}$$

$$u = 1 + t \quad (22)$$

$$\frac{du}{dt} = 1 \quad (23)$$

$$du = dt \quad (24)$$

$$\int_0^4 \frac{dt}{1+t} = \int_0^4 \frac{du}{u} \quad (25)$$

$$= \ln u \Big|_0^4 \quad (26)$$

$$= \ln (1+t) \Big|_0^4 \quad (27)$$

$$= ((\ln (1+(4))) - (\ln (1+(0)))) \quad (28)$$

$$= \ln 5 \quad (29)$$

$$51. \int_0^b e^{-x} dx$$

$$= -e^{-x} \Big|_0^b \quad (30)$$

$$= \left(\left(-e^{-(b)} \right) - \left(-e^{-(0)} \right) \right) \quad (31)$$

$$= -e^{-b} + 1 \quad (32)$$

$$= 1 - e^{-b} \quad (33)$$

$$\mathbf{63.} \quad R'(t) = 4000t, \quad V(t) = 200,000 - 25,000e^{0.1t}, \quad R(0) = 0$$

a) Find $P(t)$

$$P(t) = R(t) + V(t) - 250,000 \quad (34)$$

$$= 2000t^2 + 200,000 - 25,000e^{0.1t} - 250,000 \quad (35)$$

$$= 2000t^2 - 50,000 - 25,000e^{0.1t} \quad (36)$$

b) Find $P(10)$

$$P(10) = 2000(10)^2 - 50,000 - 25,000e^{0.1(10)} \quad (37)$$

$$= \$82,042.95 \quad (38)$$

$$\mathbf{69.} \quad \int 5x\sqrt{1-4x^2} \, dx$$

$$u = 1 - 4x^2 \quad (39)$$

$$\frac{du}{dx} = -8x \quad (40)$$

$$-\frac{5}{8} du = 5x \, dx \quad (41)$$

$$\int 5x\sqrt{1-4x^2} \, dx = \int -\frac{5}{8}\sqrt{u} \, du \quad (42)$$

$$= -\frac{5}{8} \int \sqrt{u} \, du \quad (43)$$

$$= -\frac{5}{8} \cdot \frac{2}{3} u^{3/2} + C \quad (44)$$

$$= -\frac{5}{12} (1 - 4x^2)^{3/2} + C \quad (45)$$

$$\mathbf{82.} \quad \int \frac{x^2 + 6x}{(x+3)^2} \, dx$$

$$= \int \frac{x^2 + 6x + 9 - 9}{x^2 + 6x + 9} \, dx \quad (46)$$

$$= \int \frac{x^2 + 6x + 9}{x^2 + 6x + 9} - \frac{9}{x^2 + 6x + 9} \, dx \quad (47)$$

$$= \int 1 \, dx - 9 \int \frac{1}{(x+3)^2} \, dx \quad (48)$$

$$u = x + 3 \quad (49)$$

$$du = dx \quad (50)$$

$$\int \frac{x^2 + 6x}{(x+3)^2} \, dx = x - 9 \int \frac{1}{u^2} \, du \quad (51)$$

$$= x + 9 \frac{1}{u} + C \quad (52)$$

$$= x + \frac{9}{x+3} + C \quad (53)$$

$$87. \int \frac{e^x - e^{-x}}{e^x + e^{-x}} dx$$

$$u = e^x + e^{-x} \tag{54}$$

$$\frac{du}{dx} = e^x - e^{-x} \tag{55}$$

$$\int \frac{e^x - e^{-x}}{e^x + e^{-x}} dx = \int \frac{1}{u} du \tag{56}$$

$$= \ln u + C \tag{57}$$

$$= \ln e^x + e^{-x} + C \tag{58}$$