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

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

$$u = x^5 \tag{1}$$
$$\frac{du}{dx} = 5x^4 \tag{2}$$
$$du = 5x^4\ dx \tag{3}$$
$$\frac{1}{5}\ du = x^4\ dx \tag{4}$$
$$\int x^4 e^{x^5} = \int e^u \cdot \frac{1}{5}\ du \tag{5}$$
$$= \frac{1}{5} e^u + C \tag{6}$$
$$= \frac{1}{5} e^{x^5} + C \tag{7}$$

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

$$u = \ln x \tag{8}$$
$$\frac{du}{dx} = \frac{1}{x} \tag{9}$$
$$du = \frac{1}{x}\ dx \tag{10}$$
$$\int \frac{(\ln x)^2}{x}\ dx = \int u^2\ du \tag{11}$$
$$= \frac{u^3}{3} + C \tag{12}$$
$$= \frac{(\ln x)^3}{3} + C \tag{13}$$

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

$$u = x^2 \tag{14}$$
$$\frac{du}{dx} = 2x \tag{15}$$
$$du = 2x\ dx \tag{16}$$
$$\int_0^1 2xe^{x^2}\ dx = \int_0^1 e^u\ du \tag{17}$$
$$= e^u \Big|_0^1 \tag{18}$$
$$= e^{x^2} \Big|_0^1 \tag{19}$$
$$= \left(\left(e^{(1)^2}\right) - \left(e^{(0)^2}\right)\right) \tag{20}$$
$$= e - 1 \tag{21}$$

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

$$u = 1 + t \tag{22}$$
$$\frac{du}{dt} = 1 \tag{23}$$
$$du = dt \tag{24}$$
$$\int_0^4 \frac{dt}{1+t} = \int_0^4 \frac{du}{u} \tag{25}$$
$$= \ln u \Big|_0^4 \tag{26}$$
$$= \ln(1+t) \Big|_0^4 \tag{27}$$
$$= ((\ln(1+(4))) - (\ln(1+(0)))) \tag{28}$$
$$= \ln 5 \tag{29}$$

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

$$= -e^{-x} \Big|_0^b \tag{30}$$
$$= \left(\left(-e^{-(b)}\right) - \left(-e^{-(0)}\right)\right) \tag{31}$$
$$= -e^{-b} + 1 \tag{32}$$
$$= 1 - e^{-b} \tag{33}$$

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

a) Find P(t)

$$\begin{aligned} P(t) &= R(t) + V(t) - 250,000 && (34)\\ &= 2000t^2 + 200,000 - 25,000e^{0.1t} - 250,000 && (35)\\ &= 2000t^2 - 50,000 - 25,000e^{0.1t} && (36) \end{aligned}$$

b) Find P(10)

$$\begin{aligned} P(10) &= 2000(10)^2 - 50,000 - 25,000e^{0.1(10)} && (37)\\ &= \$82,042.95 && (38) \end{aligned}$$

69. $\displaystyle\int 5x\sqrt{1-4x^x}\ dx$

$$\begin{aligned} u &= 1 - 4x^2 && (39)\\ \frac{du}{dx} &= -8x && (40)\\ -\frac{5}{8}\ du &= 5x\ dx && (41)\\ \int 5x\sqrt{1-4x^2}\ dx &= \int -\frac{5}{8}\sqrt{u}\ du && (42)\\ &= -\frac{5}{8}\int \sqrt{u}\ du && (43)\\ &= -\frac{5}{8}\cdot\frac{2}{3}u^{3/2} + C && (44)\\ &= -\frac{5}{12}(1-4x^2)^{3/2} + C && (45) \end{aligned}$$

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

$$\begin{aligned} u &= x^2 + 6x && (46)\\ \frac{du}{dx} &= 2x + 6 && (47)\\ du &= 2x + 6\ dx && (48)\\ &= 2(x+3)\ dx && (49)\\ \frac{du}{2} &= (x+3)\ dx && (50)\\ \left(\frac{du}{2}\right)^{-2} &= (x+3)^{-2}\ dx && (51)\\ \int \frac{x^2+6x}{(x+3)^2}\ dx &= \int u\ \left(\frac{du}{2}\right)^{-2} && (52) \end{aligned}$$

Try again.

$$u = (x+3)^2 \tag{53}$$
$$\frac{du}{dx} = 2(x+3) \tag{54}$$
$$du = 2(x+3)\ dx \tag{55}$$
$$\frac{du}{2} = x+3\ dx \tag{56}$$
$$\frac{du}{2} + 3 = x+6\ dx \tag{57}$$
$$\frac{x}{2}\ du + 3 = x^2+6x\ dx \tag{58}$$
$$\int \frac{x^2+6x}{(x+3)^2}\ dx = \int \frac{1}{u}\cdot\frac{x}{2}\ du + 3 \tag{59}$$
$$= \frac{1}{2}\int \frac{x}{u}\ du + 3x \tag{60}$$

Give up.

$$= -\frac{x^2+6x}{x+3} + 2x + C \tag{61}$$

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

$$u = e^x + e^{-x} \tag{62}$$
$$\frac{du}{dx} = e^x - e^{-x} \tag{63}$$
$$\int \frac{e^x - e^{-x}}{e^x + e^{-x}}\ dx = \int \frac{1}{u}\ du \tag{64}$$
$$= \ln u + C \tag{65}$$
$$= \ln e^x + e^{-x} + C \tag{66}$$