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Pg. 409 #1-58 eoo, 67, 69, 73, 75, 79

1. $\displaystyle\int x^6\,dx$

$$= \frac{x^7}{7} + C \tag{1}$$

5. $\displaystyle\int x^{1/4}\,dx$

$$= \frac{x^{5/4}}{5/4} + C \tag{2}$$

$$= \frac{4}{5}x^{5/4} + C \tag{3}$$

9. $\displaystyle\int (2t^2 + 5t - 3)\,dt$

$$= \int 2t^2\,dt + \int 5t\,dt - \int 3\,dt \tag{4}$$

$$= 2\int t^2\,dt + 5\int t\,dt - 3t + C \tag{5}$$

$$= 2 \cdot \frac{t^3}{3} + 5 \cdot \frac{t^2}{2} - 3t + C \tag{6}$$

$$= \frac{2}{3}t^3 + \frac{5}{2}t^2 - 3t + C \tag{7}$$

13. $\displaystyle\int \sqrt[3]{x}\,dx$

$$= \int x^{1/3}\,dx \tag{8}$$

$$= \frac{x^{4/3}}{4/3} + C \tag{9}$$

$$= \frac{3}{4}x^{4/3} + C \tag{10}$$

17. $\displaystyle\int \frac{dx}{x^4}$

$$= \int x^{-4}\,dx \tag{11}$$

$$= -\frac{1}{3}x^{-3} + C \tag{12}$$

21. $\displaystyle\int \left(\frac{3}{x} + \frac{5}{x^2} \right) dx$

$$= \int \frac{3}{x}\, dx + \int \frac{5}{x^2}\, dx \tag{13}$$

$$= 3 \int \frac{1}{x}\, dx + 5 \int x^{-2}\, dx \tag{14}$$

$$= 3 \ln |x| - 5x^{-1} + C \tag{15}$$

25. $\displaystyle\int 2e^{2x}\, dx$

$$= 2 \int e^{2x}\, dx \tag{16}$$

$$= 2 \cdot \frac{1}{2} e^{2x} + C \tag{17}$$

$$= e^{2x} + C \tag{18}$$

29. $\displaystyle\int e^{7x}\, dx$

$$= \frac{1}{7} e^{7x} + C \tag{19}$$

33. $\displaystyle\int 6e^{8x}\, dx$

$$= 6 \int e^{8x}\, dx \tag{20}$$

$$= \frac{6}{8} e^{8x} + C \tag{21}$$

$$= \frac{3}{4} e^{8x} + C \tag{22}$$

37. $\displaystyle\int (5x^2 - 2e^{7x})\, dx$

$$= \int 5x^2\, dx - \int 2e^{7x}\, dx \tag{23}$$

$$= 5 \int x^2\, d - 2 \int e^{7x}\, dx \tag{24}$$

$$= 5 \cdot \frac{1}{3} x^3 - 2 \cdot \frac{1}{7} e^{7x} + C \tag{25}$$

$$= \frac{5}{3} x^3 - \frac{2}{7} e^{7x} + C \tag{26}$$

41. $\displaystyle\int (3x+2)^2 \, dx$

$$= \int (3x+2)(3x+2) \, dx \tag{27}$$

$$= \int 9x^2 + 6x + 6x + 4 \, dx \tag{28}$$

$$= \int 9x^2 \, dx + \int 12x \, dx + \int 4 \, dx \tag{29}$$

$$= 9 \int x^2 \, dx + 12 \int x \, dx + 4x + C \tag{30}$$

$$= 9 \cdot \frac{1}{3}x^3 + 12 \cdot \frac{1}{2}x^2 + 4x + C \tag{31}$$

$$= 3x^3 + 6x^2 + 4x + C \tag{32}$$

45. $\displaystyle\int \left(\frac{7}{\sqrt{x}} - \frac{2}{3}e^{5x} - \frac{8}{x} \right)$

$$= \int \frac{7}{\sqrt{x}} \, dx - \int \frac{2}{3}e^{5x} \, dx - \int \frac{8}{x} \, dx \tag{33}$$

$$= 7 \int x^{-1/2} \, dx - \frac{2}{3} \int e^{5x} \, dx - 8 \int \frac{1}{x} \, dx \tag{34}$$

$$= 7 \cdot 2\sqrt{x} - \frac{2}{3} \cdot \frac{1}{5}e^{5x} - 8 \ln |x| + C \tag{35}$$

$$= 14\sqrt{x} - \frac{2}{15}e^{5x} - 8 \ln |x| + C \tag{36}$$

49. $f'(x) = x^2 - 4, \quad f(0) = 7$

$$f(x) = \int x^2 - 4 \, dx \tag{37}$$

$$= \int x^2 \, dx - \int 4 \, dx \tag{38}$$

$$= \frac{1}{3}x^3 - 4x + C \tag{39}$$

$$\frac{1}{3}(0)^3 + C = 7 \tag{40}$$

$$C = 7 \tag{41}$$

$$f(x) = \frac{1}{3}x^3 - 4x + 7 \tag{42}$$

53. $f'(x) = 3x^2 - 5x + 1, \quad f(1) = \dfrac{7}{2}$

$$f(x) = \int 3x^2 - 5x + 1 \, dx \tag{43}$$

$$= \int 3x^2 \, dx - \int 5x \, dx + \int 1 \, dx \tag{44}$$

$$= 3 \int x^2 \, dx - 5 \int x \, dx + x + C \tag{45}$$

$$= 3 \cdot \frac{1}{3}x^3 - 5 \cdot \frac{1}{2}x^2 + x + C \tag{46}$$

$$= x^3 - \frac{5}{2}x^2 + x + C \tag{47}$$

$$(1)^3 - \frac{5}{2}(1)^2 + (1) + C = \frac{7}{2} \tag{48}$$

$$C = \frac{7}{2} - 1 + \frac{5}{2} - 1 \tag{49}$$

$$C = 4 \tag{50}$$

$$f(x) = x^3 - \frac{5}{2}x^2 + x + 4 \tag{51}$$

57. $f'(x) = \dfrac{4}{\sqrt{x}}, \quad f(1) = -5$

$$f(x) = \int \frac{4}{\sqrt{x}} \, dx \tag{52}$$

$$= 4 \int x^{-1/2} \, dx \tag{53}$$

$$= 4 \cdot 2\sqrt{x} + C \tag{54}$$

$$= 8\sqrt{x} + C \tag{55}$$

$$8\sqrt{(1)} + C = -5 \tag{56}$$

$$C = -5 - 8 \tag{57}$$

$$C = -13 \tag{58}$$

$$f(x) = 8\sqrt{x} - 13 \tag{59}$$

67. $\dfrac{dE}{dt} = 30 - 10t$

a). $E(2) = 72$

$$E(t) = \int 30 - 10t \, dt \tag{60}$$

$$= \int 30 \, dt - \int 10t \, dt \tag{61}$$

$$= 30t - 10 \int t \, dt + C \tag{62}$$

$$= 30t - 10 \cdot \frac{1}{2}t^2 + C \tag{63}$$

$$= 30t - 5t^2 + C \tag{64}$$

$$30(2) - 5(2)^2 + C = 72 \tag{65}$$

$$60 - 20 + C = 72 \tag{66}$$

$$C = 72 - 40 \tag{67}$$

$$C = 32 \tag{68}$$

$$E(t) = 30t - 5t^2 + 32 \tag{69}$$

b). Find $E(3)$ and $E(5)$, where E is a percentage.

$$E(3) = 30(3) - 5(3)^2 + 32 \tag{70}$$

$$= 77\% \tag{71}$$

$$E(5) = 30(5) - 5(5)^2 + 32 \tag{72}$$

$$= 57\% \tag{73}$$

69. $I'(t) = 3.389e^{0.1049t}$

a). $I(0) = 0$

$$I(t) = \int 3.389e^{0.1049t} \, dt \tag{74}$$

$$= 3.389 \int e^{0.1049t} \, dt \tag{75}$$

$$= 3.389 \cdot \frac{1}{0.1049}e^{0.1049t} + C \tag{76}$$

$$\approx 32.31e^{0.1049t} + C \tag{77}$$

$$32.31e^{0.1049(0)} + C \approx 0 \tag{78}$$

$$C \approx 32.31 \tag{79}$$

$$I(t) \approx 32.31e^{0.1049t} - 32.31 \tag{80}$$

b). $I(27)$

$$= 32.31e^{0.1049(27)} - 32.31 \tag{81}$$

$$\approx 516 \text{ people} \tag{82}$$

c). $I(34)$

$$= 32.31e^{0.1049(34)} - 32.31 \tag{83}$$

$$\approx 1111 \text{ people} \tag{84}$$

d). $I(34) - I(34 - 7)$

$$\approx 1111 - 32.31e^{0.1049(34-7)} - 32.31 \tag{85}$$

$$\approx 1111 - 516 \tag{86}$$

$$\approx 595 \text{ people} \tag{87}$$

73. $\displaystyle\int (5t + 4)^2 t^4 \, dt$

$$= \int (5t + 4)(5t + 4)t^4 \, dt \tag{88}$$

$$= \int (25t^2 + 20t + 20t + 16)t^4 \, dt \tag{89}$$

$$= \int 25t^6 + 40t^5 + 16t^4 \, dt \tag{90}$$

$$= \int 25t^6 \, dt + \int 40t^5 \, dt + \int 16t^4 \, dt \tag{91}$$

$$= 25 \int t^6 \, dt + 40 \int t^5 \, dt + 16 \int t^4 \, dt \tag{92}$$

$$= 25 \cdot \frac{1}{7}t^7 + 40 \cdot \frac{1}{6}t^6 + 16 \cdot \frac{1}{5}t^5 + C \tag{93}$$

$$= \frac{25}{7}t^7 + \frac{20}{3}t^6 + \frac{16}{5}t^5 + C \tag{94}$$

75. $\displaystyle\int (1 - t)\sqrt{t} \, dt$

$$= \int \sqrt{t} - t\sqrt{t} \, dt \tag{95}$$

$$= \int t^{1/2} \, dt - \int t^{3/2} \, dt \tag{96}$$

$$= \frac{2}{3}t^{3/2} - \frac{2}{5}t^{5/2} + C \tag{97}$$

79. $\displaystyle\int \frac{1}{\ln 10}\frac{dx}{x}$

$$= \frac{1}{\ln 10} \int \frac{1}{x} \, dx \tag{98}$$

$$= \frac{\ln |x|}{\ln 10} + C, \text{ or } \log x + C \tag{99}$$