

5.5 Bases Other than e

Pg. 362 #'s 37-47 odd, 59, 71-81 odd

$$37) f(x) = 4^x$$

$$f'(x) = (\ln 4) 4^x$$

$$39) y = 5^{-4x}$$

$$y' = (\ln 5) 5^{-4x} (-4)$$

$$y' = -4(\ln 5) 5^{-4x}$$

$$41) f(x) = x 9^x$$

$$f'(x) = x((\ln 9) 9^x) + 9^x (1)$$

$$f'(x) = x(\ln 9) 9^x + 9^x$$

$$43) g(t) = t^2 \cdot 2^t$$

$$g'(t) = t^2 (\ln 2) 2^t + 2^t (2t)$$

$$g'(t) = t^2 (\ln 2) 2^t + 2t (2^t)$$

$$45) h(\theta) = 2^{-\theta} \cos(\pi\theta)$$

$$h'(\theta) = 2^{-\theta} (-\sin(\pi\theta) \cdot \pi) + \cos(\pi\theta) ((\ln 2) 2^{-\theta} \cdot (-1))$$

$$h'(\theta) = -\pi 2^{-\theta} \sin(\pi\theta) - (\ln 2) 2^{-\theta} \cos(\pi\theta)$$

$$47) y = \log_4(5x+1)$$

$$y' = \frac{1}{\ln 4} \cdot \frac{1}{5x+1} \cdot 5$$

$$y' = \frac{5}{(\ln 4)(5x+1)}$$

$$59) y = 2^{-x}$$

$$y' = (\ln 2) 2^{-x} \cdot (-1)$$

$$y' = -(\ln 2) 2^{-x}$$

$$y'(-1) = -(\ln 2) 2^1 = -2 \ln 2$$

$$y - 2 = -2 \ln 2 (x + 1)$$

$$71) \int 3^x dx$$

$$\frac{1}{\ln 3} 3^x + C$$

$$73) \int (x^2 + 2^{-x}) dx$$

$$\frac{1}{3} x^3 + \int 2^{-x} dx \quad \begin{matrix} u = -x \\ du = -dx \end{matrix}$$

$$\frac{1}{3} x^3 - \int 2^u du$$

$$\frac{1}{3} x^3 - \frac{1}{\ln 2} 2^{-x} + C$$

$$75) \int x(5^{-x^2}) dx$$

$$-\frac{1}{2} \int 5^u du$$

$$-\frac{1}{2} \cdot \frac{1}{\ln 5} \cdot 5^{-x^2}$$

$$\boxed{\frac{-5^{-x^2}}{2 \ln 5} + C}$$

$$u = -x^2$$

$$du = -2x dx$$

$$-\frac{1}{2} du = x dx$$

$$77) \int \frac{3^{2x}}{1+3^{2x}} dx$$

$$\frac{1}{2 \ln 3} \int \frac{1}{u} du$$

$$\boxed{\frac{1}{2 \ln 3} \ln |1+3^{2x}| + C}$$

$$u = 1+3^{2x}$$

$$du = (\ln 3) 3^{2x} \cdot (2) dx$$

$$du = 2(\ln 3) 3^{2x} dx$$

$$\frac{1}{2 \ln 3} du = 3^{2x} dx$$

$$79) \int_{-1}^2 2^x dx$$

$$\frac{1}{\ln 2} 2^x \Big|_{-1}^2$$

$$\frac{1}{\ln 2} 2^2 - \frac{1}{\ln 2} 2^{-1}$$

$$\boxed{\frac{4}{\ln 2} - \frac{1}{2 \ln 2}}$$

$$81) \int_0^1 (5^x - 3^x) dx$$

$$\left[\frac{1}{\ln 5} 5^x - \frac{1}{\ln 3} 3^x \right]_0^1$$

$$\left(\frac{1}{\ln 5} 5^1 - \frac{1}{\ln 3} 3^1 \right) - \left(\frac{1}{\ln 5} 5^0 - \frac{1}{\ln 3} 3^0 \right)$$

$$\frac{5}{\ln 5} - \frac{3}{\ln 3} - \frac{1}{\ln 5} + \frac{1}{\ln 3}$$

$$\boxed{\frac{4}{\ln 5} - \frac{2}{\ln 3}}$$