55 p.357 (5, 9, 13, 17, 19, 23, 41-55 odds, 61-67 odds)

5. $\log_2\left(\frac{1}{8}\right) = y$

$2^y = \frac{1}{8}$

$2^y = 2^{-3}$

$\boxed{y = -3}$

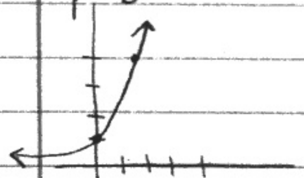
9. a. $2^3 = 8$

$\boxed{3 = \log_2 8}$

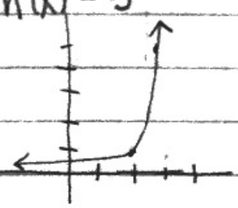
b. $3^{-1} = \frac{1}{3}$

$\boxed{-1 = \log_3 \frac{1}{3}}$

13. $y = 3^x$



17. $h(x) = 5^{x-2}$



19. a. $\log_{10} 1000 = x$

$10^x = 1000$

$\boxed{x = 3}$

b. $\log_{10} 0.1 = x$

$10^x = 0.1$

$\boxed{x = -1}$

23. a. $x^2 - x = \log_5 25$

$5^{x^2-x} = 25 = 5^2$

$x^2 - x = 2$

$x^2 - x - 2 = 0$

$(x-2)(x+1) = 0$

$\boxed{x = -1, 2}$

b. $3x + 5 = \log_2 64$

$2^{3x+5} = 64$

$2^{3x+5} = 2^6$

$3x + 5 = 6$

$3x = 1,\ \boxed{x = \frac{1}{3}}$

41. $f(x) = 4^x$

$\boxed{f'(x) = \ln(4) \cdot 4^x}$

43. $y = 5^{x-2}$

$\boxed{y' = (\ln 5)\, 5^{x-2}}$

45. $g(t) = t^2 \cdot 2^t$

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

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

$\boxed{g'(t) = t \cdot 2^t (t \ln 2 + 2)}$

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

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

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

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

49. $y = \log_3 x$

$\boxed{y' = \frac{1}{(\ln 3)x}}$

51. $f(x) = \log_2\left(\frac{x^2}{x-1}\right)$

$f(x) = \log_2(x^2) - \log_2(x-1)$

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

$f'(x) = \frac{2}{(\ln 2)x} - \frac{1}{(\ln 2)(x-1)}$

$f'(x) = \frac{2(x-1) - 1x}{(\ln 2)(x)(x-1)} = \frac{2x-2-x}{(\ln 2)(x)(x-1)}$

$\boxed{f'(x) = \frac{x-2}{(\ln 2)(x)(x-1)}}$

53. $y = \log_5 \sqrt{x^2-1}$

$y = \frac{1}{2}\log_5(x^2-1)$

$y' = \frac{1}{2} \cdot \frac{1}{(\ln 5)(x^2-1)} \cdot (2x)$

$\boxed{y' = \frac{x}{(\ln 5)(x^2-1)}}$

55. $g(t) = \frac{10 \log_4 t}{t}$

$g(t) = \frac{10}{t} \cdot \frac{\ln t}{\ln 4} = \frac{10}{\ln 4}\left[\frac{\ln t}{t}\right]$

$g'(t) = \frac{10}{\ln 4}\left[\frac{t \cdot \frac{1}{t} - \ln t}{t^2}\right]$

$g'(t) = \frac{10}{\ln 4}\left[\frac{1-\ln t}{t^2}\right] = \frac{10}{\ln 2^2}\left[\frac{1-\ln t}{t^2}\right]$

$g'(t) = \frac{10}{2\ln 2}\left[\frac{1-\ln t}{t^2}\right] = \boxed{\frac{5(1-\ln t)}{\ln 2 \cdot t^2}}$

61. $\int 3^x dx = \boxed{\left(\frac{1}{\ln 3}\right)3^x + C}$

63. $\int_{-1}^{2} 2^x dx = \frac{1}{\ln 2} \cdot 2^x \Big]_{-1}^{2}$

$\frac{1}{\ln 2}\left[2^x\right]_{-1}^{2} = \frac{1}{\ln 2}\left[2^2 - 2^{-1}\right]$

$\frac{1}{\ln 2}\left(4 - \frac{1}{2}\right) = \boxed{\frac{7}{2\ln 2} = \frac{7}{\ln 4}}$

65. $\int x\, 5^{-x^2} dx \quad u = -x^2 \quad du = -2x\,dx$

$-\frac{1}{2}\int -2x\, 5^{-x^2} dx$

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

$-\frac{1}{2} \cdot \frac{1}{\ln 5} \cdot 5^u + C$

$\frac{-5^{-x^2}}{2\ln 5} + C = \boxed{\frac{-5^{-x^2}}{\ln 25} + C}$

67. $\int \frac{3^{2x}}{1+3^{2x}} dx \quad u = 1 + 3^{2x}$

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

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

$\frac{1}{2\ln 3}\int \frac{2\ln 3 \cdot 3^{2x}}{1+3^{2x}} dx$

$\frac{1}{2\ln 3}\int \frac{du}{u} = \frac{1}{2\ln 3}\left[\ln|u|\right] + C$

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