

Review Chart 4

$$\textcircled{1} \quad 25^{\frac{3}{2}} = 5^3 \\ = \boxed{125}$$

$$\textcircled{2} \quad 27^{-\frac{2}{3}} \\ 3^{-2} \\ \boxed{\frac{1}{9}}$$

$$\textcircled{3} \quad \left(\frac{8}{27}\right)^{-\frac{1}{3}} \\ \boxed{\frac{3}{2}}$$

$$\textcircled{4} \quad \left(\frac{1}{2}\right)^{-3} = \boxed{8}$$

$$\textcircled{5} \quad 5^2 \cdot 5^{-3}$$

$$5^{-1} \\ \boxed{\frac{1}{5}}$$

$$\textcircled{6} \quad (8^2)(4^3)$$

$$(2^6)(2^6) \\ \boxed{2^{12}}$$

$$\textcircled{7} \quad (8^{\frac{1}{2}})(2^{\frac{1}{2}})$$

$$16^{\frac{1}{2}}$$

$$\boxed{4}$$

$$\textcircled{8} \quad \frac{5^3}{25^2}$$

$$\frac{5^3}{5^4}$$

$$\boxed{\frac{1}{5}}$$

$$\textcircled{9} \quad e^3 \cdot e^4 \\ \boxed{e^7}$$

$$\textcircled{10} \quad \frac{e^5}{e^{-2}} \\ \boxed{e^7}$$

$$\textcircled{11} \quad e^{-4} \cdot e^{-\frac{3}{2}}$$

$$e^{-\frac{8}{2}} \cdot e^{-\frac{3}{2}}$$

$$\boxed{e^{-\frac{11}{2}}}$$

$$\textcircled{12} \quad e^0 = \boxed{1}$$

(13) $5^{x+1} = 125$

$5^{x+1} = 5^3$

$x+1=3$

$x=2$

(14) $(x+3)^{\frac{4}{3}} = 16$

$x+3 = 16^{\frac{3}{4}}$

$x+3 = 8$

$x=5$

(15) $(\frac{1}{3})^{x-1} = 27$

$3^{-(x-1)} = 3^3$

$x-1 = -3$

$x = -2$

(16) $x^{\frac{3}{4}} = 8$

$x = 8^{\frac{4}{3}}$

$x = 16$

(17) $e^{-\frac{1}{x}} = e^{\frac{1}{2}}$

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

$x = -2$

(18) $\frac{x^2}{2} = e^2$

$\sqrt{x^2} = \sqrt{2e^2}$

$x = \pm e\sqrt{2}$

(19) $3x^3 = 9e^3$
 $(x^3)^{\frac{1}{3}} = (3e)^{\frac{1}{3}}$

$x = e\sqrt[3]{3}$

(20) $e^x = 1$
 $x = 0$

(21) $\ln x + \ln y + \ln z$ (22) $\ln x + \ln y - \ln z$

(23) $\frac{1}{2} \ln(x^2+1)$ (24) $\ln 3 + \ln x + \ln(x+1) - 2 \ln(2x+1)$

(25) $\ln(2x+1)(2x-1)$
 $\ln(4x^2-1)$ (26) $\ln \frac{3^2}{\sqrt{x^2+1}}$
 $\ln \frac{9}{\sqrt{x^2+1}}$ (27) $\ln \left(\frac{x(x+3)}{x+4} \right)$

$$(28) \quad 4^x = 16$$
$$\boxed{x=2}$$

$$(29) \quad 3^x = 3^5$$
$$\boxed{x=5}$$

$$(30) \quad 7^x = \frac{1}{49}$$
$$7^x = 7^{-2}$$
$$\boxed{x=-2}$$

$$(31) \quad 8^x = 4$$
$$2^{3x} = 2^2$$
$$3x=2$$
$$\boxed{x=\frac{2}{3}}$$

$$(32) \quad 3^{x-1} = 27$$
$$3^{x-1} = 3^3$$
$$x-1=3$$
$$\boxed{x=4}$$

$$(33) \quad \log_8 32 = x$$
$$8^x = 32$$
$$2^{3x} = 2^5$$
$$3x=5$$
$$\boxed{x=\frac{5}{3}}$$

$$(34) \quad x^4 = 625$$
$$\boxed{x=5}$$

$$(35) \quad 4^3 = x$$
$$\boxed{x=64}$$

$$(36) \quad 16^x = 4$$
$$4^{2x} = 4^1$$
$$2x=1$$
$$\boxed{x=\frac{1}{2}}$$

$$(37) \quad 7^0 = x$$
$$\boxed{x=1}$$

$$(38) \quad \log_4 8 = x$$
$$4^x = 8$$
$$4^{2x} = 2^3$$
$$2x=3$$
$$\boxed{x=\frac{3}{2}}$$

$$(39) \quad \log x = 0$$
$$\boxed{x=1}$$

$$(40) \quad \log_2 \frac{2(x+2)}{3x-5} = 3$$
$$2^3 = \frac{2(x+2)}{3x-5} \quad (41)$$

$$\frac{2x+4}{3x-5} = \frac{8}{1}$$

$$2x+4 = 24x-40$$

$$22x = 44$$

$$x=2$$

$$\frac{1}{3} \log_4 x = \log_4 4$$

$$x^{\frac{1}{3}} = 4$$
$$\boxed{x=64}$$

$$(42) \quad \log_3 3 = \log_3 \frac{x}{3}$$
$$3 = \frac{x}{3}$$
$$\boxed{x=9}$$

$$(43) \quad 9x-1=4x-16$$

$$5x = -15$$

$$x = -3$$

no solution

$$(44) \quad x-9 = 3x-13$$

$$-2x = -4$$

$$x = 2$$

$$(45) \quad \log_v (n-3)(n+4) = 1$$

$$8 = n^2 + n - 12$$

$$n^2 + n - 20 = 0$$

$$(n+5)(n-4) = 0$$

$$n \neq -5 \quad n = 4$$

$$(46) \quad x+2 = 8$$

$$x = 6$$

$$(47) \quad \log 5x^4 = \log 405$$

$$5x^4 = 405$$

$$x^4 = 81$$

$$x = 3$$

$$(48) \quad \log_3 \frac{(x+4)^2}{9} = 2$$

$$9 \cdot 9 = \frac{(x+4)^2}{9} \cdot \frac{9}{1}$$

$$\sqrt{(x+4)^2} = \sqrt{81}$$

$$x+4 = \pm 9$$

$$x = -4 \pm 9$$

$$x = -4+9 \quad x = -4-9$$

$$x = 5$$

$$x \neq -13$$

$$(49) \quad \log_4 (x+3)(2-x) = 1$$

$$(x+3)(2-x) = 4$$

$$2x - x^2 + 6 - 3x = 4$$

$$-x^2 - x + 2 = 0$$

$$x^2 + x - 2 = 0$$

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

$$x = -2 \quad x = 1$$

$$(50) \quad 1 = \log_6(7x+10) - \log_6(2x-5)$$

$$1 = \log_6 \frac{7x+10}{2x-5}$$

$$6 = \frac{7x+10}{2x-5}$$

$$7x+10 = 12x-30$$

$$-5x = -40$$

$$\boxed{x=8}$$

$$(51) \quad \log_6 \frac{(3x+7)}{(x+4)} = \log_6 \frac{6^2}{3^3}$$

$$\frac{3x+7}{x+4} = \frac{36}{27}$$

$$\frac{27(3x+7)}{9} = \frac{36(x+4)}{9}$$

$$3(3x+7) = 4(x+4)$$

$$9x+21 = 4x+16$$

$$5x = -5$$

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

$$(52) \quad e^{2x-1} = 6$$

$$\ln e^{2x-1} = \ln 6$$

$$(2x-1) \ln e = \ln 6$$

$$2x-1 = \ln 6$$

$$\ln 6 = 2x-1$$

$$\boxed{x=1.4}$$

$$(53) \quad e^{-.2x} = \frac{7}{3}$$

$$\boxed{x=-4.2}$$

$$(54) \quad \frac{50}{1+12e^{-.02x}} = 10.5$$

$$\ln e^{-.2x} = \ln \frac{7}{3}$$

$$(55) \quad y = e^{4x}$$

$$y' = 4e^{4x}$$

$$(56) \quad f(x) = e^{\frac{1}{x}}$$

$$f'(x) = e^{\frac{1}{x}} \left(-\frac{1}{x^2} \right)$$

$$x^{-1} = \frac{1}{x}$$

$$-x^{-2} = -\frac{1}{x^2}$$

$$(57) \quad y = 4x^3 e^{-x}$$

$$y' = 4x^3(-e^{-x}) + e^{-x}(12x^2)$$

$$= -e^{-x}(4x^3) + e^{-x}(12x^2)$$

$$= -e^{-x}(4x^2)[x - 3]$$

$$= -e^{-x}(4x^2)(x-3)$$

$$(58) \quad f(x) = \frac{2}{(e^x + e^{-x})^3}$$

$$f(x) = 2(e^x + e^{-x})^{-3}$$

$$f'(x) = -6(e^x + e^{-x})^{-4} (e^x - e^{-x})$$

$$= \frac{-6(e^x - e^{-x})}{(e^x + e^{-x})^4}$$

$$(59) \quad y = \sqrt[3]{2e^{3x}}$$

$$y = (2e^{3x})^{\frac{1}{3}}$$

$$y = 2^{\frac{1}{3}} e^x$$

$$y = \sqrt[3]{2} e^x$$

$$y' = e^x \sqrt[3]{2}$$

$$(60) \quad f(x) = e^{3x^2 - 2x}$$

$$f'(x) = (6x - 2)e^{3x^2 - 2x}$$

$$(61) \quad f(x) = \frac{e^{2x}}{x^2 + 1}$$

$$f'(x) = \frac{(x^2 + 1)(2e^{2x}) - e^{2x}(2x)}{(x^2 + 1)^2}$$

$$= \frac{2e^{2x}[(x^2 + 1) - x]}{(x^2 + 1)^2}$$

$$= \frac{2e^{2x}(x^2 - x + 1)}{(x^2 + 1)^2}$$

$$f(x) = (x^2 + 1)e^{-x}$$

$$f'(x) = (x^2 + 1)(-e^{-x}) + e^{-x}(2x)$$

$$= -e^{-x}(x^2 + 1 - 2x)$$

$$= \boxed{-e^{-x}(x^2 - 2x + 1)}$$

$$(63) \quad f(x) = (e^{x^2} + 3)^5$$

$$f'(x) = 5(e^{x^2} + 3)^4 e^{x^2} (2x)$$

$$= \boxed{10x e^{x^2} (e^{x^2} + 3)^4}$$

$$(64) \quad f(x) = \frac{e^{x+1}}{x+1}$$

$$f'(x) = \frac{(x+1)e^{x+1} - e^{x+1}(1)}{(x+1)^2}$$

$$f'(x) = \frac{e^{x+1}(x+1-1)}{(x+1)^2}$$

$$= \boxed{\frac{x e^{x+1}}{(x+1)^2}}$$

$$f(x) = (1-x)e^{2x}$$

$$f'(x) = (1-x)(2e^{2x}) + e^{2x}(-1)$$

$$= e^{2x} [2(1-x) - 1]$$

$$= e^{2x} (2 - 2x - 1)$$

$$= \boxed{e^{2x} (1 - 2x)}$$

$$\ln e^n = n$$

$$\ln e^x = x$$

(66)

$$y = \ln e^{2x+1}$$

$$y' = 2x+1$$

$$\boxed{y' = 2}$$

(67)

$$y = \ln (x^2 \sqrt{x+1})$$

$$y = \ln x^2 + \ln \sqrt{x+1}$$

$$y' = \frac{1}{x^2} (2x) + \frac{1}{2} \left(\frac{1}{x+1} \right)$$

$$\boxed{y' = \frac{2}{x} + \frac{1}{2(x+1)}}$$

(68)

$$y = \frac{x^2}{\ln x}$$

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

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

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

$$\textcircled{69} \quad f(x) = \frac{x}{e^{2x}} \quad \left(1, \frac{1}{e^2}\right)$$

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

$$= \frac{\cancel{e^{2x}}(1-2x)}{(e^{2x})^2}$$

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

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

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

$$m = \frac{-1}{e^{2x}}$$

$$\textcircled{70} \quad f(x) = 1 + e^{-x}$$

$$\text{at } x=0 \quad f(0) = 1+1 = 2$$

$$f'(x) = -e^{-x}$$

$$(0, 2)$$

$$f'(0) = -e^{-0}$$

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

$$m = -1$$

$$y - 2 = -x$$

$$\boxed{y = -x + 2}$$

$$\textcircled{71} f(x) = 1 + 2x \ln x \quad (1, 1)$$

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

$$= 2 - 2(\ln x)$$

$$\boxed{y - 1 = 2(x - 1)}$$

$$f'(1) = 2 - 2(\ln 1)$$

$$m = 2$$

$$\textcircled{72} f(x) = 2 \ln x^3 \quad (e, 6)$$

$$f(x) = 6 \ln x$$

$$\boxed{y - 6 = \frac{6}{e}(x - e)}$$

$$f'(x) = \frac{6}{x}$$

$$f'(e) = \frac{6}{e}$$

$$m = \frac{6}{e}$$