

Section 6.6

6.6 1

$$4) 4^{-3v-2} = 4^{-v}$$

$\Downarrow$

$$-3v-2 = -v$$

$$-2 = 2v$$

$$\underline{\underline{-1 = v}}$$

$$6) 3^{2x+1} \cdot 3^x = 243$$

$$3^{(2x+1)+x} = 3^5$$

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

$\Downarrow$

$$3x+1 = 5$$

$$3x = 4$$

$$\underline{\underline{x = \frac{4}{3}}}$$

$$8) 625 \cdot 5^{3x+3} = 125, 10) \left(\frac{1}{64}\right)^{3n} \cdot 8 = 2^6$$

$$(5^4)(5^{(3x+3)}) = 5^3$$

$$5^{(4+(3x+3))} = 5^3$$

$$5^{(3x+7)} = 5^3$$

$\Downarrow$

$$3x+7 = 3$$

$$3x = -4$$

$$\underline{\underline{x = \frac{-4}{3}}}$$

$$\left(\frac{1}{2^6}\right)^{3n} (2^3) = 2^6$$

$$(2^{-6})^{3n} (2^3) = 2^6$$

$$(2^{(-6)(3n)}) (2^3) = 2^6$$

$$(2^{-18n}) (2^3) = 2^6$$

$$2^{(-18n+3)} = 2^6$$

$\Downarrow$

$$-18n+3 = 6$$

$$-3 = 18n$$

$$\underline{\underline{\frac{-3}{18} = n \rightarrow \frac{-1}{6} = n}}$$

$$12) 2e^{6x} = 13$$

$$e^{6x} = \frac{13}{2}$$

$$\Downarrow$$

$$6x = \ln\left(\frac{13}{2}\right)$$

$$x = \frac{\ln\left(\frac{13}{2}\right)}{6}$$

$$14) 2 \cdot 10^{9a} = 29$$

$$10^{9a} = \frac{29}{2}$$

$$\Downarrow$$

$$9a = \log\left(\frac{29}{2}\right)$$

$$a = \frac{\log\left(\frac{29}{2}\right)}{9}$$

$$16) 7e^{3n-5} + 5 = -89$$

$$7e^{(3n-5)} = -94$$

$$e^{(3n-5)} = \frac{-94}{7}$$

$$\Downarrow$$

$$3n-5 = \ln\left(\frac{-94}{7}\right)$$

no solution

because we
cannot take
logarithm
of negative
number

$$18) -5e^{9x-8} - 8 = -62$$

$$-5e^{(9x-8)} = -54$$

$$e^{(9x-8)} = \frac{-54}{-5} = \frac{54}{5}$$

$$\Downarrow$$

$$9x-8 = \ln\left(\frac{54}{5}\right)$$

$$9x = 8 + \ln\left(\frac{54}{5}\right)$$

$$x = \frac{8 + \ln\left(\frac{54}{5}\right)}{9}$$

$$20) 2^{x+1} = 5^{2x-1}$$

$$\ln(2^{(x+1)}) = \ln(5^{(2x-1)})$$

$$(x+1) \ln(2) = (2x-1) \ln(5)$$

$$x \ln(2) + \ln(2) = 2x \ln(5) - \ln(5)$$

$$\ln(2) + \ln(5) = 2x \ln(5) - x \ln(2)$$

$$\ln((2)(5)) = x(2 \ln(5) - \ln(2))$$

$$\ln(10) = x(\ln(5)^2 - \ln(2))$$

$$\ln(10) = x(\ln(25) - \ln(2))$$

$$\ln(10) = x\left(\ln\left(\frac{25}{2}\right)\right)$$

$$\frac{\ln(10)}{\ln\left(\frac{25}{2}\right)} = x$$

$$26) 3^{2x+1} = 7^{x-2}$$

$$\ln(3^{(2x+1)}) = \ln(7^{(x-2)})$$

$$(2x+1) \ln(3) = (x-2) \ln(7)$$

$$2x \ln(3) + \ln(3) = x \ln(7) - 2 \ln(7)$$

$$\ln(3) + 2 \ln(7) = x \ln(7) - 2x \ln(3)$$

$$\ln(3) + \ln(7^2) = x(\ln(7) - 2 \ln(3))$$

$$24)$$

$$6.6 \angle 3$$

$$4e^{3x+3} - 7 = 53$$

$$4e^{(3x+3)} = 60$$

$$e^{(3x+3)} = \frac{60}{4} = \frac{30}{2} = 15$$

$\Downarrow$

$$3x+3 = \ln(15)$$

$$3x = -3 + \ln(15)$$

$$x = \frac{-3 + \ln(15)}{3}$$

$$\ln(3) + \ln(49) = x(\ln(7) - \ln(3^2))$$

$$\ln((3)(49)) = x(\ln(7) - \ln(9))$$

$$\ln(147) = x\left(\ln\left(\frac{7}{9}\right)\right)$$

$$\frac{\ln(147)}{\ln\left(\frac{7}{9}\right)} = x$$

$$\ln\left(\frac{7}{9}\right)$$

$$28) 3e^{3-3x} + 6 = -37$$

$$3e^{(3-3x)} = -37$$

$$e^{(3-3x)} = \frac{-37}{3}$$

$$\Downarrow$$

$$(3-3x) = \ln\left(\frac{-37}{3}\right)$$

no solution
because we
cannot take
logarithm of
negative number

$$30) \log_{324}(18) = \frac{1}{2}$$

$$\Downarrow$$

$$18 = (324)^{\frac{1}{2}} = \sqrt{324}$$

$$32) -8 \log_9 x = 16$$

$$\log_9 x = \frac{16}{-8} = -2$$

$$\Downarrow$$

$$x = 9^{-2}$$

$$x = \frac{1}{9^2} = \frac{1}{81}$$

$$34) 2 \log(8n+4) + 6 = 10$$

$$2 \log(8n+4) = 4$$

$$\log(8n+4) = \frac{4}{2} = 2$$

$$\Downarrow$$

$$(8n+4) = 10^2$$

$$8n+4 = 100$$

$$8n = 96$$

$$n = \frac{96}{8}$$

$$\underline{\underline{n = 12}}$$

$$36) \ln(10-3x) = \ln(-4x)$$

$$\Downarrow$$

$$10-3x = -4x$$

$$\underline{\underline{x = -10}}$$

$$38) \log(x+3) - \log(x) = \log(74)$$

$$\log\left(\frac{x+3}{x}\right) = \log(74)$$

$$\Downarrow$$

$$\frac{x+3}{x} = 74$$

$$x+3 = 74x$$

$$3 = 73x$$

$$\underline{\underline{\frac{3}{73} = x}}}$$

$$40) \log_4 (6-m) = \log_4 3m \quad | \quad 42) \log_9 (2n^2 - 14n) = \log_9 (-45 + n^2) \quad 6.6 \boxed{5}$$

$\Downarrow$

$$6-m = 3m$$

$$6 = 4m$$

$$\frac{6}{4} = m$$

$$\underline{\underline{\frac{3}{2} = m}}$$

$\Downarrow$

$$2n^2 - 14n = -45 + n^2$$

$$n^2 - 14n + 45 = 0$$

$$(n-9)(n-5) = 0$$

$$n-9=0$$

$$\underline{\underline{n=9}}$$

$$n-5=0$$

$$n=5$$

discard

$$44) \log (x+2) = \log (x) + \log (12)$$

$$\log (x+2) = \log ((x)(12))$$

$\Downarrow$

$$x+2 = 12x$$

$$2 = 11x$$

$$\underline{\underline{\frac{2}{11} = x}}$$

$$46) \log_2 (7x+6) = 3$$

$\Downarrow$

$$7x+6 = 2^3$$

$$7x+6 = 8$$

$$7x = 2$$

$$\underline{\underline{x = \frac{2}{7}}}$$

$$48) \log_8 (x+6) - \log_8 (x) = \log_8 (58)$$

6.6 6

$$\log_8 \left(\frac{x+6}{x} \right) = \log_8 (58)$$

$\Downarrow$

$$\frac{x+6}{x} = 58$$

$$x+6 = 58x$$

$$6 = 57x$$

$$\underline{\underline{\frac{6}{57} = x}}}$$

$$50) \log_3 (3x) - \log_3 (6) = \log_3 (77)$$

$$\log_3 \left(\frac{3x}{6} \right) = \log_3 (77)$$

$\Downarrow$

$$\frac{3x}{6} = 77$$

$$\frac{x}{2} = 77$$

$$\underline{\underline{x = 154}}$$