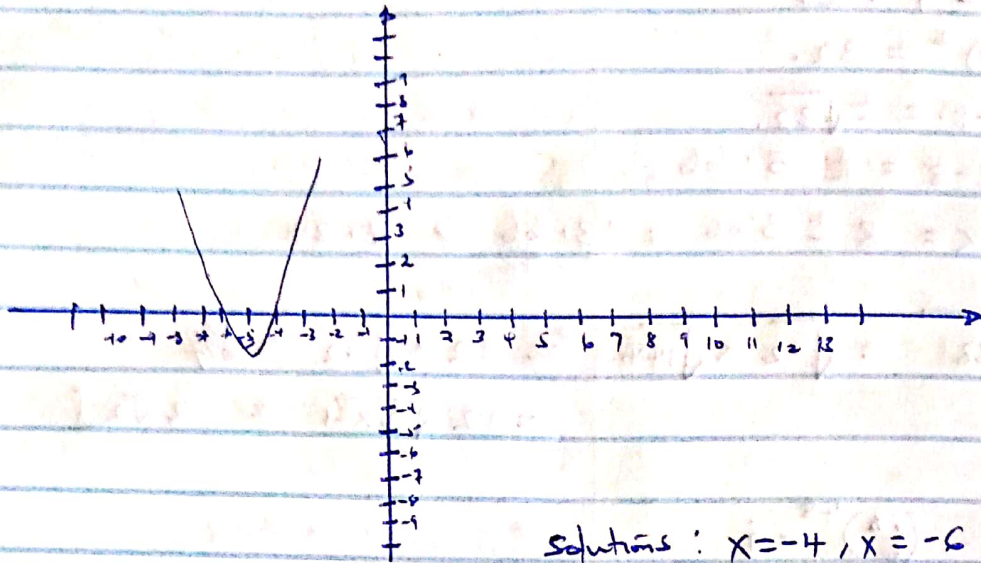


Final exam Review

1.



solutions: $x = -4, x = -6$

2. $5x^2 + 4x + 1 = 0$

$a = 5, b = 4, c = 1$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-4 \pm \sqrt{4^2 - 4(5)(1)}}{10}$$

$$x = \frac{-4 \pm \sqrt{-4}}{10} = -0.4 \pm \frac{2j}{10}$$

3. $\frac{2x^2}{2} - \frac{32x}{2} + \frac{128}{2} = 0$

$$x^2 - 16x + 64 = 0$$

$$p = 64$$

$$s = -16$$

$$x^2 - 8x - 8x + 64 = 0$$

$$x(x-8) - 8(x-8) = 0$$

$$(x-8)(x-8) = 0$$

$$x = 8$$

4. $6x^2 - 12x - 38 = 10$

$$\cancel{6}x^2 - \cancel{12}x - \cancel{48} = 0$$

$$x^2 - 2x - 8 = 0$$

$$x^2 + 2x - 4x - 8 = 0$$

$$x(x+2) - 4(x+2) = (x+2)(x-4) = 0$$

$$x = -2, x = 4$$

$$5. (x-8)^2 - 7 = 25$$

$$(x-8)^2 = 32.$$

$$x-8 = \pm \sqrt{32}.$$

$$x-8 = \pm 5.66$$

$$x = 8 \pm 5.66 = 13.66 \text{ or } 2.34$$

$$6. \sqrt{-288} = \sqrt{-2} \times \sqrt{144} = 12 \times \sqrt{-2} = 12j \\ = 12 \sqrt{2 \times -1} = 12 \sqrt{2} j$$

$$7. i^{49} = (i^4)^{12} \cdot i \\ = (\sqrt{-1})^{48} \cdot \sqrt{-1} = \sqrt{-1} = j = i$$

$$8. (-4i)^3 \cdot 2i \\ = -64(\sqrt{-1})^3 \cdot 2\sqrt{-1} = -128 (\sqrt{-1})^3 \sqrt{-1} = -128$$

$$9. 18 - x^2 = 39 \\ x^2 = 18 - 39 = -21 \\ x = \pm \sqrt{-21} = \pm \sqrt{21} \times \sqrt{-1} \\ = \pm 4.5825j$$

$$10. (-6+10i) - (4-2i) = -7+12i$$

$$11. (-7+i)^2 = (-7+i)(-7+i) = 49 - 14i - 1$$

$$12. (5-2i)(2+7i) - 2i(3i)^2 \\ = 10 + 31i - 14 + 18i = -4 + 49i$$

$$13. \frac{-35-15i}{5i} = \frac{-7}{i} - 3 = -7i - 3$$

$$14. \frac{6i}{1-i} = \frac{6i(1+i)}{(1-i)(1+i)} = \frac{6i - 6i^2}{1-i^2} = \frac{6i+6}{2} = 3i+3$$

$$15. \frac{5-8i}{-1-4i}$$

$$\frac{a+bi}{c+di} = \frac{ac+bd+(bc-ad)i}{c^2+d^2}$$

$$= \frac{-5+32+(8+20)i}{1+16} = \frac{27+28i}{17}$$

$$16. (-8x^4y^3)(2x^5y^2) + 7x^9y^5$$

factoring common factor x^4y^2

$$\cancel{x^4y^2} [-8\cancel{y} \cdot 2\cancel{x} + 7x^5y^3]$$

$$\cancel{x^4y^2} [7x^5y^3 - 8y \cdot 2x]$$

$$-16x^9y^5 + 7x^9y^5 = x^9y^5(7-16) = -9x^9y^5$$

$$17. \frac{15x^2y - 6x^7y}{(3xy)^2} = \frac{15x^2y - 6x^7y}{9x^2y^2}$$

$$= \frac{15}{9y} - \frac{6x^5}{9y} = \frac{15-6x^5}{9y}$$

$$18. (1-2n)^3 - 7n(n^2-2)$$

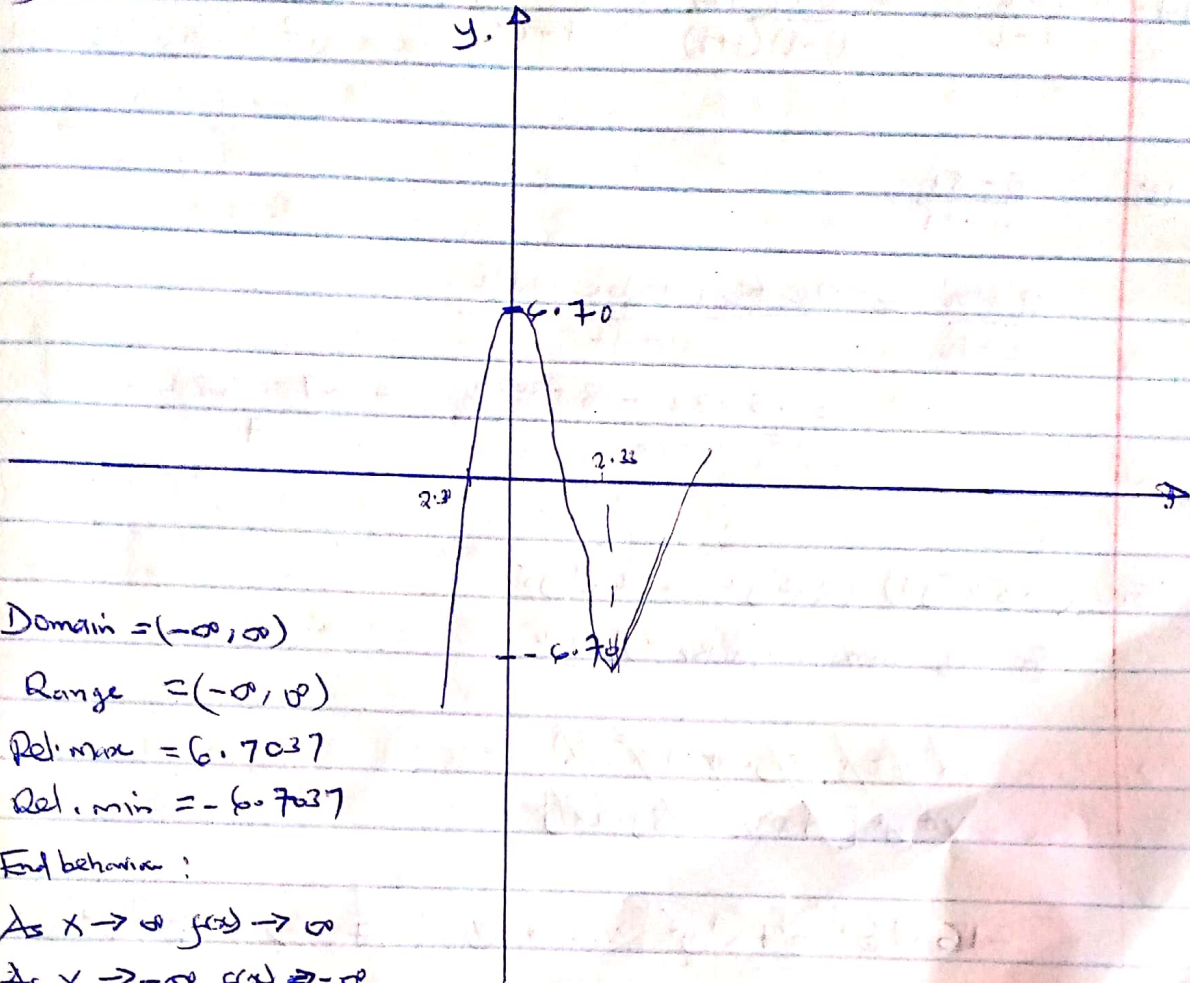
$$= 8n^3 + 12n^2 - 6n + 1 - 7n^3 + 14n$$

$$= 15n^3 + 12n^2 + 8n + 1$$

$$19. 4(2-3u)(u^2-2u+10) = 4(2u^3 - 3u^3 + 20u^2 - 6u^2 - 4u + 10u + 20 - 30u)$$

20

$$f(x) = 2x^3 - 7x^2 + 6$$



$$\text{Domain} = (-\infty, \infty)$$

$$\text{Range} = (-\infty, \infty)$$

$$\text{Rel. max} = 6.7037$$

$$\text{Rel. min} = -6.7037$$

End behavior:

$$\text{As } x \rightarrow \infty, f(x) \rightarrow \infty$$

$$\text{As } x \rightarrow -\infty, f(x) \rightarrow -\infty$$

$$\text{Incr intervals } (-\infty, 0.0) \quad (2.333, \infty)$$

$$\text{dec interval } (0.0, 2.333)$$

$$21. \quad 9y^7 - 144y \quad \text{G.C.F} = 9y$$

$$9y(y^6 - 16) = 9y(y^3 - 4)(y^3 + 4)$$

$$22. \quad 54x^3 + 256y^3$$

$$2(27x^3 + 125y^3) = 2((3x)^3 + (5y)^3)$$

$$23. \quad x^3y^2 - 343y^2$$

$$y^2(x^3 - 343) = y^2((x)^3 - 7^3)$$

$$24. \quad 2a^3 + 28a^2 + 96a \quad \text{G.C.F} = 2a$$

$$2a(a^2 + 14a + 48)$$

$$2a(a+6)(a+8)$$

$$25. \quad 15n^3 - 6n^2 - 25n + 10 = (5n-2)(3n^2-5)$$

$$26. \quad 12x^3 - 3x^2 = 0$$

$$3x^2(4x-1) = 0$$

$$4x-1=0$$

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

$$27. \quad 9x^4 - 16 = 0$$

$$(3x^2-4)(3x^2+4) = 0$$

$$3x^2-4=0 \quad 3x^2+4=0$$

$$3x^2 = \frac{4}{3} \quad 3x^2 = -4$$

$$x^2 = \frac{4}{9} \quad x^2 = -\frac{4}{3}$$

$$x = \pm \sqrt{\frac{4}{9}} \quad x = \pm j\sqrt{\frac{4}{3}}$$

$$28. \quad x^3 + 512 = 0$$

$$x^3 = -512$$

$$x = \sqrt[3]{-512} = -8j$$

$$29. \quad 8x^3 - 125 = 0$$

$$\frac{8x^3}{8} = \frac{125}{8}$$

$$x = \sqrt[3]{\frac{125}{8}} = \frac{5}{2}$$

$$30. \quad 2x^3 - 16x^2 - 40x = 0$$

$$2x(x^2 - 8x - 20) = 0$$

$$2x(x+2)(x-10) = 0$$

$$x = 0$$

$$x = -2$$

$$x = 10$$

$$31. 2x^3 - 5x^2 + 40x - 100 = 0$$

$$(2x-5)(x^2+20) = 0$$

$$2x-5=0$$

$$2x=5$$

$$x=2.5$$

$$x^2+20=0$$

$$x^2 = -20$$

$$x = \pm \sqrt{-20}$$

$$32. \frac{21a^3b^3 + 35a^4b^2 - 56a^2b^4}{-7a^2b^2}$$

$$\frac{21a^3b^3}{-7a^2b^2} + \frac{35a^4b^2}{-7a^2b^2} - \frac{56a^2b^4}{-7a^2b^2}$$

$$-3ab - 5a^2 + 8b^2 = 8b^2 - 5a^2 - 3ab$$

$$33. \frac{6a^2 + 11a - 10}{3a-2} = \frac{(3a-2)(2a-5)}{(3a-2)} = 2a-5$$

$$34. \frac{5m^2 - 18m - 8}{m-4} = \frac{(5m+2)(m-4)}{(m-4)} = (5m+2)$$

$$35. f(x) = 2x^2 - 9x + 2$$

$$g(x) = 1 - 6x$$

$$h(x) = x^2 - 4$$

$$(f-g)(x) = f(x) - g(x)$$

$$(2x^2 - 9x + 2) - (1 - 6x) = 2x^2 - 3x + 1$$

$$36. \left(\frac{f}{h}\right)(x) = \frac{f(x)}{h(x)} = \frac{2x^2 - 9x + 2}{x^2 - 4}$$

$$37. (g+f)(x) = f(x) + g(x) = (2x^2 - 9x + 2) + (1 - 6x) = 2x^2 - 15x + 3$$

$$\begin{aligned}
 38 \quad (g \circ h)(x) &= g(h(x)) \\
 &= (2x^2 - 6x + 2)(x^2 - 4) \\
 &= 2x^4 - 8x^2 - 4x^3 + 24x + 2x^2 - 8 \\
 &= 2x^4 - 4x^2 - 4x^3 + 24x - 8 \\
 &= x^2 - 4 - 6x^3 + 24x \\
 39. \quad &= -6x^3 + x^2 + 24x - 4.
 \end{aligned}$$

$$\begin{aligned}
 39. \quad (f \circ g)(x) &= f(g(x)) = f(1-6x) \\
 &= 2(1-6x)^2 - 9(1-6x) + 2 \\
 &= 2(1-12x+36x^2) - 9 + 54x \\
 &= 72x^2 + 30x - 5
 \end{aligned}$$

$$\begin{aligned}
 40 \quad (h \circ g)(-7) &= (h \circ g)(x) = (x^2 - 4) - (1 - 6x) \\
 &= x^2 - 5 + 6x \\
 x &= -7 \\
 (h \circ g)(-7) &= (-7)^2 - 5 + 6(-7) \\
 &= 49 - 5 - 42 = 2
 \end{aligned}$$

$$41. \quad -8\sqrt{63} = -8\sqrt{9 \times 7} = -8(3\sqrt{7})$$

+

$$42. \quad 2\sqrt[3]{-54} = 2[\sqrt[3]{-27 \times 2}] = 2(-3)\sqrt[3]{2} = -6.2^{\frac{1}{3}}$$

$$43. \quad 6\sqrt[4]{405} = 6(\sqrt[4]{81 \times 5}) = 18\sqrt[4]{5} = 18(5^{\frac{1}{4}})$$

$$44. \quad 3\sqrt[3]{49x^9y^{16}} = \sqrt[3]{x^9y^{15} \cdot 49y} = x^3y^5 \cdot \sqrt[3]{49y}$$

$$45. \quad \sqrt[3]{-625m^{28}n^{12}} = \sqrt[3]{5(-125m^{27}n^{12})} = -5m^9n^4\sqrt[3]{5m}$$

$$46. -2 \sqrt[4]{80x^8y^9z} = -2 \sqrt[4]{16x^8y^8(5yz)} = -2 \cdot 2x^2y^2 \sqrt[4]{5yz}$$

$$47. \sqrt[4]{8a^3b} \cdot \sqrt{10a^2b^7} = [8a^3b \cdot 10a^2b^7]^{\frac{1}{4}} \\ (80a^5b^8)^{\frac{1}{4}} \\ [5 \times 16a^4b^8 \cdot a]^{\frac{1}{4}} \\ (5a)^{\frac{1}{4}} \cdot 2ab^2$$

$$48. (3-2\sqrt{k})^2 \\ (3-2\sqrt{k})(3-2\sqrt{k}) = (9-12\sqrt{k}+4k)^{\frac{1}{2}} =$$

$$49. \sqrt[4]{\frac{2m^7}{625n^4}} = \left[\frac{2m^7}{625n^4} \right]^{\frac{1}{4}}$$

$$50. \frac{2\sqrt{3}-3(6+\sqrt{3})}{6-\sqrt{3}(6+\sqrt{3})} = \frac{12\sqrt{3}+6-18-3\sqrt{3}}{6^2-3} \\ = \frac{9\sqrt{3}-12}{33}$$

$$51. 5\sqrt[3]{32x^3y^4} - 3xy\sqrt[3]{4y} \\ = (2^{\frac{5}{3}}x^{\frac{1}{3}}y^{\frac{4}{3}}) - 3xy(2^{\frac{2}{3}}y^{\frac{1}{3}}) \\ 5(2^{\frac{5}{3}}x^{\frac{1}{3}}y^{\frac{4}{3}} - 3 \cdot 2^{\frac{2}{3}}xy^{\frac{4}{3}}) \\ xy^{\frac{1}{3}}[5 \cdot 2^{\frac{5}{3}} - 3 \cdot 2^{\frac{2}{3}}]$$

$$52. 8\sqrt[4]{48} - 5\sqrt{90} + 9\sqrt[4]{3} \\ 8(16 \times 3)^{\frac{1}{4}} - 5(10 \times 9)^{\frac{1}{2}} + 9 \cdot 3^{\frac{1}{4}} \\ 8 \cdot 2 \cdot 3^{\frac{1}{4}} - 5\sqrt{10} \cdot 3^{\frac{1}{4}} + 9 \cdot 3^{\frac{1}{4}} \\ 3[16 \cdot 3^{\frac{1}{4}} - 5\sqrt{10} + 9 \cdot 3^{\frac{1}{4}}]$$

53.

$$(-2a)^{4/3} = (\sqrt[3]{-2a})^4$$

$$54. \sqrt[4]{18x^9y^2} = (\overbrace{18x^9y^2}^{1/4})^{1/4} \\ = 18^{1/4} \cdot x^{9/4} \cdot y^{2/4}$$

$$55. \frac{x^{7/3}}{x^{2/3}} = x^{7/3 - 2/3} = x^{5/3} = (\sqrt[3]{x})^5$$

$$56. \sqrt[4]{36W^6} = 36^{1/4} W^{6/4} = 36^{1/4} \sqrt{W} = \sqrt[4]{36} \cdot \sqrt{W}$$

$$57. -7 + (16P+8)^{1/3} = -1$$

$$(16P+8)^{1/3} = 6$$

$$\text{Let } 16P+8 = y$$

$$y^{1/3} = 6$$

$$y = 6^3 = 216$$

$$16P+8 = 216$$

$$16P = 216 - 8 = 208$$

$$P = 13$$

$$58. (3x-21)^{1/3} = (19-x)^{1/3}$$

powers are same, bases are same

$$3x-21 = 19-x$$

$$4x = 40$$

$$x = 10$$

$$59. \frac{\sqrt[4]{7W-5}}{2} = \sqrt[4]{W-2}$$

$$(\sqrt[4]{7W-5})^4 = (2\sqrt[4]{W-2})^4$$

$$7W-5 = 16(W-2)$$

$$7W-5 = 16W-32$$

$$27 = 9W$$

$$W = 3$$

$$60. (\sqrt{q-21})^2 = (\sqrt{q+7})^2$$

$$q-21 = (\sqrt{q+7})\sqrt{q+7}$$

$$q-21 = q + 14\sqrt{q} + 49$$

$$-21 = 14\sqrt{q} + 49$$

$$-\frac{5}{\sqrt{q}} = \frac{14}{\sqrt{q}}$$

$$(\sqrt{q})^2 = (-5)^2$$

$$q = 25$$

$$61. \frac{n^2+7n}{4n^2+28n} = \frac{n(n+7)}{4n(n+7)} = \frac{1}{4}$$

$$62. \frac{y^2-36}{5y^2-24y-24} = \frac{(y-6)(y+6)}{(5y+4)(y-6)} = \frac{y+6}{5y+4}$$

$$63. \frac{m^2-6m+8}{2m-2} \cdot \frac{10}{m-4} = \frac{(m-2)(m-4)}{2m-2} \cdot \frac{10}{(m-4)}$$

$$= \frac{m-2}{2(m-1)} \cdot 10 = 5 \frac{(m-2)}{m-1}$$

$$64. \frac{6c^2+13c-63}{6c^2-17c+7} \cdot \frac{2c^2-9c+4}{12c+54} = \frac{(3x-7)(2x+9)(2x-1)(x-4)}{(2x-1)(3x-7)(6)(2x+9)}$$

$$= \frac{x-4}{6} = \frac{x}{6} - \frac{2}{3} = \frac{1}{6} - \frac{2}{3}$$

$$65. \frac{1-h^2}{2h^2-14h+2} \cdot \frac{2h-2}{6} = \frac{(1+h)(1-h)}{2(h+1)(h-6)} \times \frac{6-3}{2(h-1)} = \frac{3}{h-6}$$

$$66. \frac{2a^2+14a}{8a^2} \times \frac{1}{10a+70} = \frac{2a(a+7)}{8a^2(10)(a+7)} = \frac{1}{40a}$$

$$67. \frac{8a-18}{3a^2+14a+9} + \frac{7}{3a+2}$$

$$\frac{8a-18}{(3a+2)(a+4)} + \frac{7}{(3a+2)}$$

$$\frac{8a-18 + 7(a+4)}{(3a+2)(a+4)} = \frac{8a-18+7a+28}{(3a+2)(a+4)} = \frac{15a+10}{(3a+2)(a+4)}$$

$$= \frac{5(3a+2)}{(3a+2)(a+4)} = \frac{5}{a+4}$$

$$68. \frac{22w+11}{8w^2-6w} - \frac{3}{2w}$$

$$\frac{22w+11-3(4w-3)}{2w(4w-3)} = \frac{22w+11-12w+9}{2w(4w-3)}$$

$$\frac{(10w+20)}{2w(4w-3)} = \frac{5(w+2)}{2w(4w-3)}$$

$$= \frac{5(w+2)}{w(4w-3)}$$

$$69. \frac{n^2-9n+14}{4n+28} \cdot \frac{(n-2)(n+7)}{4(n+7)} \cdot \frac{n+7}{n+7} = \frac{n-2}{4}$$

$$70. \frac{2v^2+16v}{2v^2-5v-7}$$

$$\frac{4v^2+28v-32}{10v^2-10}$$

$$= \frac{2v(v+8)}{(v+1)(2v-7)} \cdot \frac{10(v+1)(v+1)}{4(v+1)(v+8)}$$

$$= \frac{5v}{(2v-7) \cdot 1}$$

$$= \frac{20v}{8v-28} = \frac{5v}{2v-7}$$

$$71. \frac{2}{a-2} = \frac{3a-1}{2a+11}$$

$$2(2a+11) = (3a-1)(a-2)$$

$$4a+22 = 3a^2-7a+2$$

$$3a^2-11a-20=0$$

$$(3a+4)(a-5)=0$$

$$a=5 \text{ or } a=-\frac{4}{3}$$

$$72. \frac{4}{3v} - \frac{1}{v} = \frac{v+2}{2v^2}$$

$$\frac{4-3}{3v} = \frac{v+2}{2v^2}$$

$$\frac{1}{3v} = \frac{v+2}{2v^2} \Rightarrow 2v^2 = 3v(v+2)$$

$$2v^2 = 3v^2 + 6v$$

$$-6v = v^2$$

$$-6 = v$$

$$v = -6$$

$$73. 2^{w+4} \cdot 2^{w+6} = 2^{2w+1}$$

$$2^{(w+4)+(w+6)} = 2^{2w+1}$$

$$2w+10 = 2w+1$$

$$(w+4) = (2w+1) - (w+6)$$

$$w+4 = w-5$$

$$74. 2^{3k-1} \cdot 2^{5k-7} = 16 = 2^4$$

$$(3k-1) + (5k-7) = 4$$

$$8k-8 = 4$$

$$8k = 12 \Rightarrow k = 1.5$$

$$75 \quad \log_2 128 = 7 \\ 2^7 = 128$$

$$76 \quad 8^3 = 512. \\ \log_8 512 = 3$$

$$77 \quad \log_{16} \frac{1}{2} = \frac{\log_{10} \frac{1}{2}}{\log_{10} 16} = -0.25$$

$$78 \quad \log 1000 = \log_{10} 1000 = \log_{10} 10^3 = 3 \log_{10} 10 = \underline{3}$$

$$79. \quad \log_5 38 = \frac{\log_{10} 38}{\log_{10} 5} = 2.26$$

$$80. \quad \frac{1}{3} [\log_5 8 + \log_5 27] - \log_5 3$$

$$\frac{1}{3} \left(\log_5 \frac{8 \times 27}{3} \right) = \frac{1}{3} \log_5 72 = \log_5 \sqrt[3]{72}$$

$$\begin{aligned} & \frac{1}{3} \log_5 \frac{8 \times 27}{3} - \log_5 3 \\ &= \log_5 \frac{216}{3} - \log_5 3 \\ &= \log_5 6 - \log_5 3 = \log_5 \frac{6}{3} = \log_5 2 \end{aligned}$$

$$\begin{aligned} 81 \quad \log_3 \sqrt[4]{m^5 n^2} &= \frac{1}{4} \log_3 m^5 + \frac{1}{4} \log_3 n^2 \\ &= \frac{1}{4} \log_3 m^5 \cdot n^2 \end{aligned}$$

$$\begin{aligned} 82. \quad \log_7 (4n-7) &= \log_7 (-3n) \\ 4n-7 &= -3n \\ 7n &= 7 \quad n=1 \end{aligned}$$

$$83. \log_2 4 + \log_2 (C-9) = 5$$

$$\log_2 4 + \log_2 (C-9) = 5 \log_2 2$$

$$\log_2 (4C-9) = \log_2 32$$

$$4C-36 = 32$$

$$4C = 68 \Rightarrow C = 17$$

$$84. e^{X-9} = 74$$

$$X-9 = \ln 74 = 4.304$$

$$X = 9 + 4.304 = 13.304$$

$$85. \ln 87 = x+4$$

$$87 = e^{x+4}$$

$$86. \frac{1}{2} \ln 256 - 3 \ln 2 = \ln (256)^{\frac{1}{2}} - \ln 8$$

$$= \ln \frac{16}{8} = \ln 2$$

$$87. \ln \left(\frac{m^5}{n^2} \right)^3 = 3 [\ln m^5 + \ln n^2]$$

$$88. \ln 8 + \ln (n-9) = 5 \ln 2$$

$$\ln 8(n-9) = \ln 32$$

$$\ln 8n - 72 = \ln 32$$

$$8n - 72 = 32$$

$$8n = 104 \Rightarrow n = \frac{104}{8} = 13$$

$$89. 4e^{3k} + 1 = 85$$

$$\frac{4e^{3k}}{4} = \frac{84}{4}$$

$$e^{3k} = 21$$

$$\frac{3k}{3} = \frac{\ln 21}{3} \Rightarrow k = 1.0148$$