1. $\log_2(x+3) = 3 - \log_2(x-4)$

$\log_2(x+3) + \log_2(x-4) = 3$

$\log_2(x^2 - x - 12) = 3$

$x^2 - x - 12 = 2^3$

$x^2 - x - 12 = 8$

$x^2 - x - 20 = 0$

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

$x = \{5, -4\}$

	$x+3>0$	$x-4>0$	
5	$8>0$	$1>0$	✓
-4	$-1>0$	$-8>0$	✗

$x = 5$
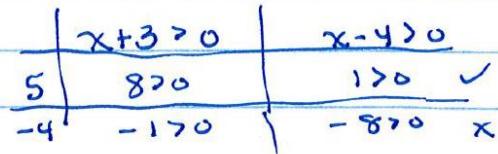
2. $y = \log_c b(x-h)$

① $y = \log_c(b(x-1))$

$0 = \log_c(b(2-1))$

$0 = \log_c b$

$c^0 = b$

$1 = b$

OR $b = \dfrac{1}{x-h} = \dfrac{1}{2-1} = \dfrac{1}{1}$

② $1 = \log_c(4-1)$

$1 = \log_c 3$

$c^1 = 3$

$c = 3$

$\therefore y = \log_3(x-1)$

3. $y = ac^{bx}$

$6470 = 10\,575(0.97)^{2x}$

$0.61182 = 0.97^{2x}$

$\log_{0.97} 0.61182 = 2x$

$\dfrac{\log 0.61182}{\log 0.97} = 2x$

$16.1303 = 2x$

$8.07 = x$

$\approx 8\,yrs.$

4. $5 \leq 9 \log_2 \left(-\frac{2}{3}(x+1)\right) - 13$

$5 = 9 \log_2 -\frac{2}{3}(x+1) - 13$

$18 = 9 \log_2 -\frac{2}{3}(x+1)$

$2 = \log_2 -\frac{2}{3}(x+1)$

$4 = -\frac{2}{3}(x+1)$

$-6 = x+1$

$-7 = x$

$x \leq -7 \quad \text{or} \quad]-\infty, -7]$

①   ②

—————|————————|——————≷————→
     -7 ↑ -1
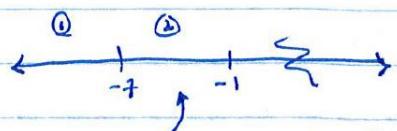
let $x = -4$ $5 \leq 9 \log_2 \left(-\frac{2}{3}(-3)\right) - 13$

$5 \leq 9 \log_2 2 - 13$

$5 \leq 9 - 13$

$5 \leq -4$ false

$y = 5$

-7

---

5. $\log_z \left(\frac{x}{zy^6}\right)^3 =$

① $3 \log_z \left(\frac{x}{zy^2}\right) = 3\left[\log_z x - \log_z (zy^2)\right]$

$= 3\log_z x - 3\left[\log_z z + \log_z y^2\right]$

$= 3\log_z x - 3\log_z z - 3(2\log_z y)$
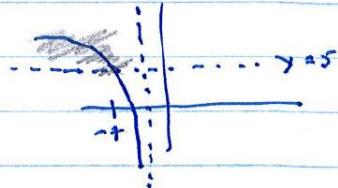
$= 3(4) - 3(1) - 6(1.5)$

$= 12 - 3 - 9$

$= 0$

② $\log_z \frac{x^3}{z^3 y^6} = \log_z x^3 - \log_z z^3 y^6$

$= 3\log_z x - \left[\log_z z^3 + \log_z y^6\right]$

$= 3\log_z x - 3\log_z z - 6\log_z y$

$= 3(4) - 3(1) - 6(1.5)$

$= 12 - 3 - 9$

$= 0$

1. $\log_5(x-4) + \log_5 9 = \log_5(6-5x)$

$\log_5(9x-36) = \log_5(6-5x)$

$9x-36 = 6-5x$

$14x = 42$

$x = 3$

$x-4 > 0 \qquad 6-5x > 0$

$\underset{x}{3-4>0} \qquad \underset{x}{6-15>0}$

No solution

2. $y = \log_c b(x-h) \qquad \rightarrow \qquad$ ① $\quad y = \log_c b(x-2)$

② $\quad 0 = \log_c b(3-2) \qquad$ or $\quad b = \dfrac{1}{x-h} = \dfrac{1}{3-2}$

$0 = \log_c b$

$c^0 = b \qquad\qquad\qquad\qquad\qquad = \dfrac{1}{1}$

$1 = b$

③ $\quad -2 = \log_c (6-2)$

$-2 = \log_c 4$

$c^{-2} = 4$

$c = \frac{1}{2}$

$y = \log_{0.5}(x-2)$

3. $y = ac^{bx} \qquad\qquad 20\,425 = 25(2)^{2x}$

$817 = 2^{2x}$

$\log_2(817) = 2x$

$\dfrac{\log 817}{\log 2} = 2x$

$9.6742 = 2x$

$4.84 = x$
$\quad_{days}$

4. $-2 \geq -8\log_3\left(\frac{3}{2}(x+7)\right) + 14$

$-2 = -8\log_3\left(\frac{3}{2}(x+7)\right) + 14$

$-16 = -8\log_3\left(\frac{3}{2}(x+7)\right)$

$2 = \log_3\left(\frac{3}{2}(x+7)\right)$

$3^2 = \frac{3}{2}(x+7)$

$9 = \frac{3}{2}(x+7)$

$6 = x+7$

$-1 = x$

$x \geq -1$ or $x \in [-1, +\infty[$

let $x = -5$
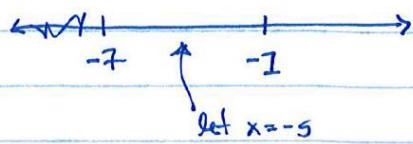
$-2 \geq -8\log_3\left(\frac{3}{2}(2)\right) + 14$

$-2 \geq -8\log_3 3 + 14$

$-2 \geq -8 + 14$

$-2 \geq 6$ False

$x = -2$
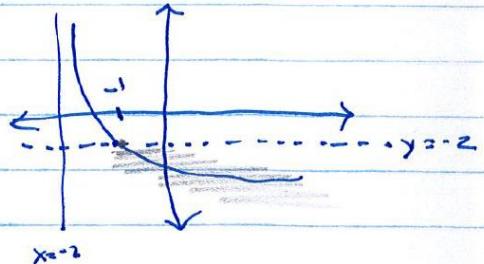
5. $\log_z\left(\frac{zx^2}{y}\right)^3 = \log_z\left(\frac{z^3 x^6}{y^3}\right)$

$= \log_z z^3 + \log_z x^6 - \log_z y^3$

$= 3\log_z z + 6\log_z x - 3\log_z y$

$= 3(0.5) + 6(0.5) - 3(2)$

$= 3 + 3 - 6$

$= 0$