

$$1. \log_3 x + \log_9 x = 12$$

$$\Rightarrow \log_3 x + \frac{\log_3 x}{\log_3 9} = 12$$

$$\Rightarrow \log_3 x + \frac{\log_3 x}{2} = 12$$

$$\Rightarrow 2 \log_3 x = 24$$

$$\Rightarrow \log_3 x = 12$$

$$\Rightarrow x = 4096$$

$$2. IP(1) = 2 + a - 4 + b$$

$$= a + b - 2 = 0$$

$$II \quad P(-3) = 54 + 9a + 12 + b$$

$$= 66 + 9a + b = 0$$

$$II - I$$

$$\Rightarrow 68 + 8a = 0$$

$$\Rightarrow a = -\frac{17}{2}$$

$$\Rightarrow \frac{17}{2} + b = 2$$

$$\Rightarrow b = -\frac{13}{2}$$

$$3. f(2) = f(-1)$$

$$\Rightarrow 8 + 12 + 2a + b = -1 + 3 - a + b$$

$$\Rightarrow 20 + 2a = 2 - a$$

$$\Rightarrow 3a = -18$$

$$\Rightarrow a = -6$$

$$4. f(-1) = -20$$

$$\Rightarrow -20 = 6 - 11 - 22 - a + b$$

$$= -27 - a$$

$$\Rightarrow a = -1$$

$$5. \log x + \log y = 7$$

$$\log x - \log y = 1$$

$$\Rightarrow 2 \log x = 8$$

$$\Rightarrow \log x = 4$$

$$\Rightarrow x = 10000$$

$$\Rightarrow 4 + \log y = 7$$

$$\Rightarrow \log y = 3$$

$$\Rightarrow y = 1000$$

$$6. x^3 + mx + n$$

$$(x-k)^2$$

$$(ax+b)(x-k)(x-k)$$

$$= (ax^2 + bx - axk - bk)(x-k)$$

$$= (ax^3 + bx^2 - ax^2k - bkx - ax^2k - bxk + axk^2 - bk^2)$$

$$= ax^3 + bx^2 - 2ax^2k - 2bkx + axk^2 - bk^2$$

$$= ax^3 + (b - 2ak)x^2 + (ak^2 - 2bk)x - bk^2$$

$$\Rightarrow a=1,$$

$$b - 2ak = 0$$

$$\Rightarrow b - 2k = 0$$

$$\Rightarrow b = 2k$$

$$\Rightarrow m = ak^2 - 2bk$$

$$\Rightarrow m = k^2 - 4k^2$$

$$= -3k^2$$

$$\Rightarrow n = -2k^3$$

$$\Rightarrow \left(\frac{-3k^2}{3}\right)^3 + \left(\frac{-2k^3}{2}\right)^2$$

$$= -k^6 + k^6 = 0$$

$$\Rightarrow \left(\frac{m}{3}\right)^3 + \left(\frac{n}{2}\right)^2 = 0$$