

30 31/7/24

$$1. (i) \ln y = mx + c$$

$$\text{Gradient} = \frac{5-1}{1-3}$$

$$= -2$$

$$\ln y = -2x + c$$

$$5 = -2(1) + c$$

$$c = 7$$

$$\ln y = -2x + 7$$

$$y = e^{-2x+7}$$

$$(ii) -3 = m - 2k + 7$$

$$-10 = -2k$$

$$k = 5$$

$$2. (i) 2y - x^3 y = 3x^2$$

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

$$2 - x^3 = \frac{3x^2}{y} \div \frac{3x^2}{3x^2}$$

$$\frac{8x^2}{10x^2}$$

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

$$\frac{2}{3} - \frac{x^3}{3}$$

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

$$m = -\frac{1}{3} \quad c = \frac{2}{3}$$

~~7~~

(ii) ~~tan~~ Gradient = $\tan \theta$

$$\tan^{-1}\left(-\frac{1}{3}\right) = \theta$$

$$180 + (\tan^{-1}(-\frac{1}{3})) = 161.66 \text{ (1 d.p.)}$$

$$\theta = 161.6^\circ \text{ (1 d.p.)}$$

3. (i) $N = 2800e^{-\frac{t}{20}}$

$$= \cancel{1877} \cancel{1876} \underline{1877} \text{ (nearest whole number)}$$

(ii) $1400 = 2800e^{-\frac{t}{20}}$

$$\frac{1}{2} = e^{-\frac{t}{20}}$$

$$\ln \frac{1}{2} = -\frac{t}{20}$$

$$t = 14 \text{ (nearest whole number)}$$

$$2012 + 14 = \underline{2026}$$

4. (a) $2^{6y} + \log_2 2^{-4} = 28$

$$2^{6y} - 4 = 28$$

$$2^{6y} = 32$$

$$\log_2 32 = 6y$$

$$\log_2 2^5 = 6y$$

$$5 = 6y$$

$$y = \underline{\underline{\frac{5}{6}}}$$



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(b) ~~log~~ $\log_9(x^2+4x+4) + \log_9 x^2 = \log_9 9$ ✓

$$x^4 + 4x^3 + 4x^2 = 9$$

$$x^4 + 4x^3 + 4x^2 - 9 = 0$$

$$\begin{array}{r} x^3 + 5x^2 + 9x + 9 \\ x-1 \overline{) x^4 + 4x^3 + 4x^2 - 9} \\ \underline{x^4 - x^3} \\ 5x^3 + 4x^2 - 9 \\ \underline{5x^3 - 5x^2} \\ 9x^2 - 9 \\ \underline{9x^2 - 9x} \\ 9x - 9 \\ \underline{9x - 9} \\ 0 \end{array}$$

$$\begin{aligned} x^4 + 4x^3 + 4x^2 - 9 &= (x-1)(x^3 + 5x^2 + 9x + 9) \\ &= (x-1)(x+3)(x^2 + 2x + 3) \end{aligned} \quad \checkmark$$

$$\begin{array}{r} x^2 + 2x + 3 \\ x+3 \overline{) x^3 + 5x^2 + 9x + 9} \\ \underline{x^3 + 3x^2} \\ 2x^2 + 9x + 9 \\ \underline{2x^2 + 6x} \\ 3x + 9 \\ \underline{3x + 9} \\ 0 \end{array}$$

~~$x=1$ or $x=-3$ N.A.~~

$$\frac{-2 \pm \sqrt{5-4}}{2 \times 1}$$

$$x^2 + 2x + 3$$

$$\underline{x=1} \text{ or } \underline{x=-3} \text{ N.A. or } x = \frac{-2 \pm \sqrt{5-4}}{2 \times 1} \text{ N.A.}$$

4

$$5. \quad \begin{array}{r} 2x^2 - 5x + 12x + 2 \\ x^2 - x - 2 \overline{) 2x^4 - 7x^3 + 3x^2 + 12x - 4} \\ \underline{2x^4 - 2x^3 - 4x^2} \end{array}$$

$$\begin{array}{r} -5x^3 + 7x^2 + 12x - 4 \\ -5x^3 + 5x^2 + 10x \end{array}$$

$$\underline{2x^2 + 2x - 4}$$

$$\underline{2x^2 + 2x - 4}$$

$$\underline{2x^2 - 2x - 4}$$

$$4x$$

$$\text{Remainder} = \underline{4x}$$

$$6. (i) \quad f(2) = 16 + 12 + 2a + b$$

$$= 0$$

$$16 + 28 + 2a + b = 0 \quad \dots (1)$$

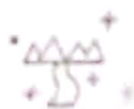
$$f(-2) = -4 - 2a + b$$

$$= 0$$

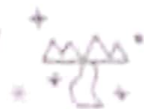
$$b - 2a = 4 \quad \dots (2)$$

$$b = 4 + 2a \quad \dots (2)$$

$$\text{Sub (2) in (1),} \quad 28 + 2a + 4 + 2a = 0$$



SHOW A MOUNTAIN OF CARE FOR OUR FAMILY
BY GIVING THEM VALLEY-DATION!



Dai Zitong (10) 3P3

$$32 + 4a = 0$$

$$32 = -4a$$

$$\underline{a = -8} \text{ (shown)}$$

$$b = 4 + 2(-8)$$

$$= -12$$

$$\underline{b = -12}$$

(i) $f(x) = 2x^3 + 3x^2 - 8x - 12$

$$= 0$$

$$2x^2 + 7x + 6$$

$$x-2 \overline{) 2x^3 + 3x^2 - 8x - 12}$$

$$2x^3 - 4x^2$$

$$7x^2 - 8x - 12$$

$$7x^2 - 14x$$

$$6x - 12$$

$$6x - 12$$

$$0$$

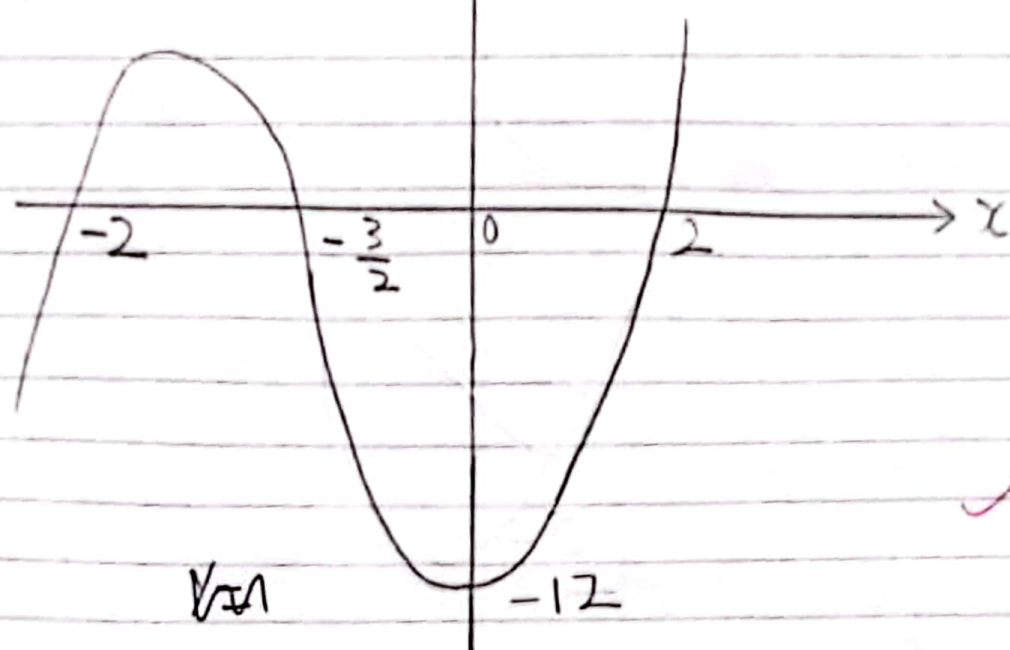
$$2x^3 + 3x^2 - 8x - 12 = (x-2)(2x^2 + 7x + 6)$$

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

$$\underline{x=2} \text{ or } \underline{x=-\frac{3}{2}} \text{ or } \underline{x=-2}$$



(ii)



~~y-intercept~~ $f(0) = 2(0)^3 + 3(0)^2 + 1 - 8(0) - 12$
 $= -12$



SHOW YOUR CARE WHEN YOUR FAMILY MEMBERS SEEM TROUBLED.

IT MATTERS!

