Graphs & Equations 2 Worked Solutions

(1a) Straight line ∴ assume linear equation: $y = mx + c$

Consider (0, 2.1), (1, 4.7)

$m = \frac{\Delta y}{\Delta x} = \frac{4.7 - 2.1}{1 - 0} = \frac{2.5}{1} = 2.5$

∴ $y = 2.5x + 2.1$ ✓

(1b) Consider (0, −2), (2, −6)

$m = \frac{\Delta y}{\Delta x} = \frac{-6 - (-2)}{2 - 0} = \frac{-4}{2} = -2$

$y = -2x - 2$ ✓

(2) Consider (0, 0), (5, 10), (10, 35) (0, 0) ∴ $c = 0$

Assume polynomial. $y = ax^2 + bx + c$

① (5, 10): $10 = 25a + 5b$

② (10, 35) $35 = 100a + 10b$

$2 \times ① - ②$: $20 = 50a + 10b$

$35 = 100a + 10b$ −

$-15 = -50a$

$a = \frac{3}{10} = 0.3$

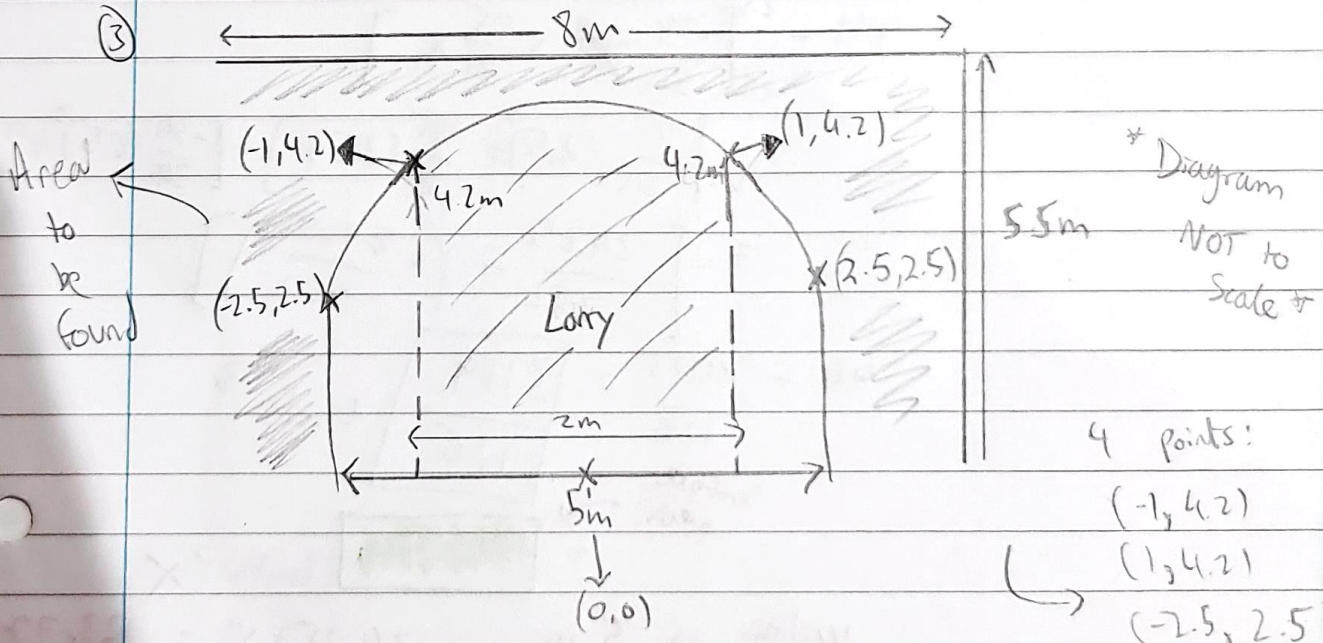
∴ $20 = 50(\frac{3}{10}) + 10b$

$5 = 10b$

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

∴ $y = 0.3x^2 + \frac{1}{2}x$ ✓

(3)



4 points:

(−1, 4.2)

(1, 4.2)

(−2.5, 2.5)

(2.5, 2.5)

Consider $(2.5, 2.5), (4.2, 1), (4.2, -1)$ assume polynomial:

$y = ax^2 + bx + c$

① $2.5 = 6.25a + 2.5b + c$ $(2.5, 2.5)$

② $4.2 = a + b + c$ $(4.2, 1)$

③ $4.2 = a - b + c$ $(4.2, -1)$

② − ③ $4.2 = a + b + c$

$4.2 = a - b + c$ −

$0 = 2b \therefore \boxed{b = 0}$

if $b = 0$, ① − ②:

$2.5 = 6.25a + c$

$4.2 = a + c$ −

$-1.7 = 5.25a$

$\boxed{a = -\frac{34}{105}}$

if $a = -\frac{34}{105}$ and $b = 0$:

$4.2 = -\frac{34}{105} + 0 + c$

$\boxed{c = \frac{95}{21}}$

Volume of bricks = Total area − area on curve × surface area

$= [5.5 \times 8] - \int_{-2.5}^{2.5} \left(\left(\frac{-34}{105}\right)x^2 + \frac{95}{21} \right)$ (MAX 2.5, MIN −2.5)

$= 44 - \left[\frac{-34}{315}x^3 + \frac{95}{21}x \right]_{-2.5}^{2.5}$

$= \left[\frac{-34}{315}(2.5)^3 + \frac{95}{21}(2.5) \right] - \left[\frac{-34}{315}(-2.5)^3 + \frac{95}{21}(-2.5) \right]$

$= \left[\frac{2425}{252} - \left(-\frac{2425}{252} \right) \right]$

$44 - \frac{2425}{126} = \boxed{\frac{3119}{126}}$ units^3

surface area → $= \boxed{24.75}$ units^3 ×

Width is 5 m $\therefore 24.75 \times 5 = \underline{123.77 \text{ m}^3}$