IB Math AA SL Investigation: *Volumes of Cones*

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The following gives the page(s) on which questions are answered:

- Quesiton 1
  - Using data from the table, the system of equations is:

$$\begin{aligned} y(x) &= a_0 + a_1 x + a_2 x^2 + a_3 x^3 \\ y(-1) &= a_0 + a_1(-1) + a_2(-1)^2 + a_3(-1)^3 = 4 \\ y(0) &= a_0 + a_1(0) + a_2(0)^2 + a_3(0)^3 = 2 \\ y(1) &= a_0 + a_1(1) + a_2(1)^2 + a_3(1)^3 = 4 \\ y(2) &= a_0 + a_1(2) + a_2(2)^2 + a_3(2)^3 = 4 \end{aligned}$$

    Simplifying gives:

$$\begin{aligned} a_0 - a_1 + a_2 - a_3 &= 4 \\ a_0 + 0a_1 + 0a_2 + 0a_3 &= 2 \\ a_0 + a_1 + a_2 + a_3 &= 4 \\ a_0 + 2a_1 + 4a_2 + 8a_3 &= 4 \end{aligned}$$

    Constructing an augmented matrix from this system gives:

$$\begin{bmatrix} 1 & -1 & 1 & -1 & 4 \\ 1 & 0 & 0 & 0 & 2 \\ 1 & 1 & 1 & 1 & 4 \\ 1 & 2 & 4 & 8 & 4 \end{bmatrix}$$

    Where the right-most column is the column containing constant terms

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