MEMORANDUM

Name: ..... Class: .....

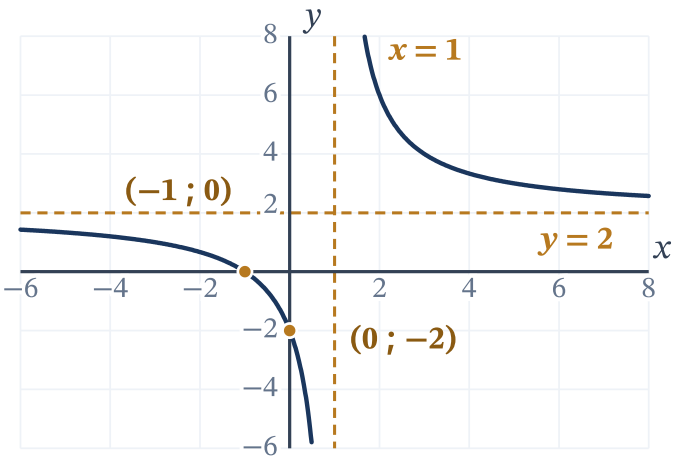
Date: .....

MARK ____ / 23

Answer all questions. Show all your working — marks are awarded for method as well as the final answer. **Teacher copy: accept any correct equivalent method.**

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1 Write down the asymptotes of $y = \frac{4}{x-1} + 2$. (2)



$x = 1$ and $y = 2$ ✓✓ (2)

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2 Determine the y-intercept of $y = \frac{4}{x-1} + 2$. (2)

$\frac{4}{-1} + 2 = \mathbf{-2}$ ✓✓ (2)

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3 Determine the x-intercept of $y = \frac{4}{x-1} + 2$. (3)

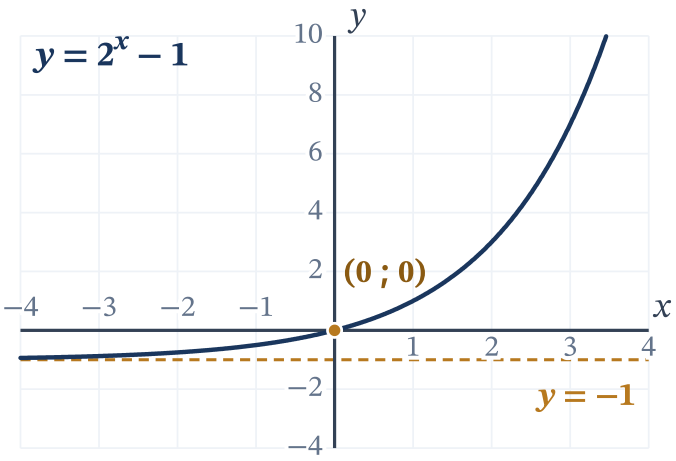
$4 = -2(x-1) \rightarrow \mathbf{x = -1}$ ✓✓✓ (3)

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4 Write down the domain and range of $y = \frac{4}{x-1} + 2$. (2)

Domain $x \in \mathbb{R}, x \neq 1$; range $y \in \mathbb{R}, y \neq 2$ ✓✓ (2)

5 Write down the equation of the asymptote of $y = 2^x - 1$. **(1)**



> $y = -1$ ✓ (1)

6 Determine the y-intercept of $y = 2^x - 1$. **(2)**

> $2^0 - 1 = 0$ ✓✓ (2)

7 Write down the range of $y = 2^x - 1$. **(1)**

> $y > -1$ ✓ (1)

8 Describe the transformation from $y = 2^x$ to $y = 2^x - 1$. **(2)**

> A translation of **1 unit downwards** ✓✓ (2)

9 For $y = 2^{x-3} + 1$, write down the equation of the asymptote and describe the transformation from $y = 2^x$. **(3)**

> Asymptote $y = 1$ ✓; the graph is shifted 3 units RIGHT ✓ and 1 unit UP ✓ (3)

10 Determine the y-intercept of $y = 4 \cdot 3^{x+1} - 5$. **(3)**

> $x = 0$: $y = 4 \times 3^1 - 5$ ✓ $= 12 - 5$ ✓ $= 7$ ✓ (3)

11 Explain why the value of p does NOT change the horizontal asymptote of an exponential graph. **(2)**

> p is a horizontal shift ✓; the asymptote is a horizontal line whose height is set by q only, so sliding the graph sideways leaves it at $y = q$ ✓ (2)

TOTAL: 23 marks

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