FOUNDATION & HIGHER

HIGHER EXTENDS

Name ..... Class .....

A12: Recognising graphs

Reason about the shapes and features of standard graphs

20 marks · 25 minutes · Non-calculator

1) Explain why the graph of $y = \frac{1}{x}$ never crosses either axis.

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[Question 1: 2 marks]

2) Explain why 2^x is always positive.

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[Question 2: 2 marks]

3) Ali says the graph of $y = x^3$ is the same shape as $y = x^2$. Explain how they are different.

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[Question 3: 2 marks]

4) Which of $y = 3x - 1$, $y = x^2 - 1$ and $y = \frac{1}{x}$ passes through $(1, 2)$? Show your working.

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[Question 4: 2 marks]

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5) Explain why the graph of $y = \sin x$ repeats every $360°$.

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[Question 5: 1 marks]

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6) Explain how you can tell from its equation that $y = -2x + 5$ is a straight line that slopes downwards.

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[Question 6: 2 marks]

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7) Show that $y = x^2 - 4$ crosses the x-axis at $x = 2$ and $x = -2$

[Question 7: 2 marks]

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8) Explain why the maximum value of $\cos x$ is 1

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[Question 8: 1 marks]

9) Describe what happens to $y = 3^x$ as x becomes large and negative. Explain why.

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[Question 9: 2 marks]

10) Show that $y = x^3 - x$ passes through (0, 0) and (1, 0)

[Question 10: 2 marks]

11) In which quadrants is the graph of $y = \frac{5}{x}$? Explain.

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[Question 11: 2 marks]

End of paper – 20 marks in total

Answers and brief mark scheme

Q	Answer	Method / notes
1	Explanation	$x = 0$ is not allowed (C1); y can never be 0 (C1).
2	Explanation	Multiplying positive 2s, and negative powers are reciprocals of positives (C2).
3	Explanation	x^3 is negative for negative x (C1); it has rotational symmetry, x^2 has line symmetry (C1).
4	$y = 3x - 1$	$3 - 1 = 2$ (M1); others give 0 and 1 (C1).
5	Explanation	Angles 360° apart give the same point on the unit circle (C1).
6	Explanation	Form $y = mx + c$ so linear (C1); $m = -2 < 0$ (C1).
7	Shown	$x^2 = 4$ (M1); C1.
8	Explanation	$\cos x$ is the x-coordinate on a circle of radius 1 (C1).
9	Gets close to 0	$3^{-x} = \frac{1}{3^x}$ (M1); denominator grows, never 0 (C1).
10	Shown	$0 - 0$ and $1 - 1$ (M1); C1.
11	First and third	Positive x gives positive y (C1); negative gives negative (C1).