Inverse Functions (Grade 12)

MEMORANDUM

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

Date: .....

MARK ____ / 20

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.**

1 Determine the equation of h^{-1}, the inverse of $h(x) = 3x - 6$, in the form $y = \ldots$ (2)

$x = 3y - 6 \rightarrow \boldsymbol{y = \frac{1}{3}x + 2}$ ✓✓ (2)

2 Determine the inverse of $f(x) = 2x^2$. (2)

$x = 2y^2 \rightarrow \boldsymbol{y = \pm\sqrt{\frac{x}{2}}}$ ✓✓ (2)

3 Is the inverse of $f(x) = 2x^2$ a function? Give a reason. (2)

No — because of the ±, one x-value gives two y-values, so it fails the vertical line test. ✓✓ (2)

4 Restrict the domain of $f(x) = 2x^2$ so that f^{-1} is a function. (1)

$\boldsymbol{x \geq 0}$ (or $x \leq 0$) ✓ (1)

5 Determine the equation of k^{-1} if $k(x) = 2^x$. (2)

$\boldsymbol{y = \log_2 x}$ ✓✓ (2)

6 Write down the domain and range of k^{-1} if $k(x) = 2^x$. (2)

Domain $\boldsymbol{x > 0}$; range $\boldsymbol{y \in \mathbb{R}}$ ✓✓ (2)

7 The graph of f^{-1} is the reflection of f in which line? (1)

$\boldsymbol{y = x}$ ✓ (1)

8 The point $(2\ ;\ 7)$ lies on f. Write down a point on f^{-1}. (1)

(7 ; 2) ✓ (1)

9 State the definition of a function. (2)

A rule in which every input value has exactly ONE output value ✓✓ (2)

10 Explain, using the definition, why the inverse of $f(x) = 3x^2$ is not a function unless the domain is restricted. **(3)**

> f is many-to-one — $f(-2)$ and $f(2)$ both give 12 ✓; reflecting swaps inputs and outputs, so one input would map to two outputs ✓; restricting to $x \geq 0$ makes f one-to-one, so the inverse is a function ✓ **(3)**

11 Which line test tells you whether the INVERSE of a graph will be a function? **(2)**

> The horizontal line test applied to the ORIGINAL graph ✓; if a horizontal line cuts it more than once, the inverse is not a function ✓ **(2)**

TOTAL: 20 marks

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