1)

evidence of rearranged quadratic equation (may be seen in working)   *A1*
e.g. $x^2 - 3x + k^2 - 4 = 0$, $k^2 - 4$

evidence of discriminant (must be seen explicitly, not in quadratic formula)   *(M1)*
e.g. $b^2 - 4ac$, $\Delta = (-3)^2 - 4(1)(k^2 - 4)$

recognizing that discriminant is greater than zero (seen anywhere, including answer)   *R1*
e.g. $b^2 - 4ac > 0$, $9 + 16 - 4k^2 > 0$

correct working (accept equality)   *A1*
e.g. $25 - 4k^2 > 0$, $4k^2 < 25$, $k^2 = \dfrac{25}{4}$

both correct values (even if inequality never seen)   *(A1)*
e.g. $\pm\sqrt{\dfrac{25}{4}}$, ±2.5

correct interval   *A1*   *N3*
e.g. $-\dfrac{5}{2} < k < \dfrac{5}{2}$, $-2.5 < k < 2.5$

> **Note:** Do not award the final mark for unfinished values, or for incorrect or reversed
> inequalities, including $\leq$, $k > -2.5, k < 2.5$.

2)

(a)   (i) $(2, -17)$ or $x = 2$, $y = -17$ *A1A1*   *N2*

    (ii)   evidence of valid approach   *(M1)*
      e.g. graph, completing the square, equating coefficients

      $f(x) = 2(x - 2)^2 - 17$ *A1*   *N2*

                           [4 marks]

(b)   evidence of valid approach   *(M1)*
    e.g. graph, quadratic formula

    $-0.9154759...$, $4.915475...$
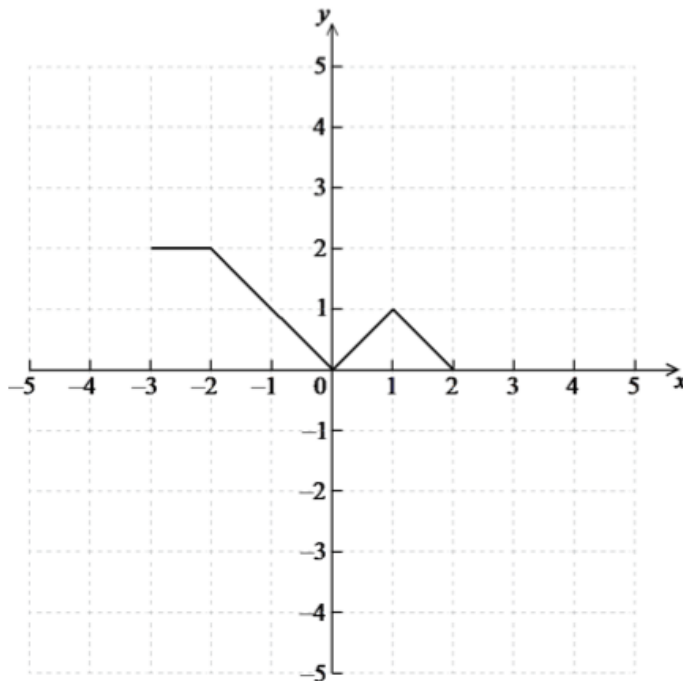
    $x = -0.915$, 4.92 *A1A1*   *N3*
                           [3 marks]

                           Total [7 marks]

3) (a) interchanging x and y (seen anywhere) **(M1)**
e.g. $x = 2y - 1$

correct manipulation **(A1)**
e.g. $x + 1 = 2y$

$f^{-1}(x) = \dfrac{x+1}{2}$ ***A1*** ***N2***

[3 marks]

(b) **METHOD 1**

attempt to find $g(1)$ or $f(1)$ **(M1)**
$g(1) = 5$ **(A1)**
$f(5) = 9$ ***A1*** ***N2***

[3 marks]

METHOD 2

attempt to form composite (in any order) **(M1)**
e.g. $2(3x^2 + 2) - 1,\ 3(2x-1)^2 + 2$

$(f \circ g)(1) = 2(3 \times 1^2 + 2) - 1\ (= 6 \times 1^2 + 3)$ **(A1)**
$(f \circ g)(1) = 9$ ***A1*** ***N2***

[3 marks]

Total [6 marks]

4)

(a) $x = 4$ (must be an equation)   *A1*   *N1*

[1 mark]

(b) $h = 4, k = 2$ *A1A1*   *N2*

[2 marks]

(c) attempt to substitute coordinates of any point on the graph into f *(M1)*
e.g. $f(0) = 6, 6 = a(0-4)^2 + 2, f(4) = 2$

correct equation (do **not** accept an equation that results from $f(4) = 2$)   *(A1)*
e.g. $6 = a(-4)^2 + 2, 6 = 16a + 2$

$$a = \frac{4}{16} \left(= \frac{1}{4} \right)$$ *A1*   *N2*

[3 marks]

Total [6 marks]

5)

(a)

                                                                                                                      A2   *N2*
[2 marks]

(b) $a = -2, b = -1$ *A2A2*   *N4*

Note: Award *A1* for $a = 2$, *A1* for $b = 1$.

[4 marks]

Total [6 marks]

6)

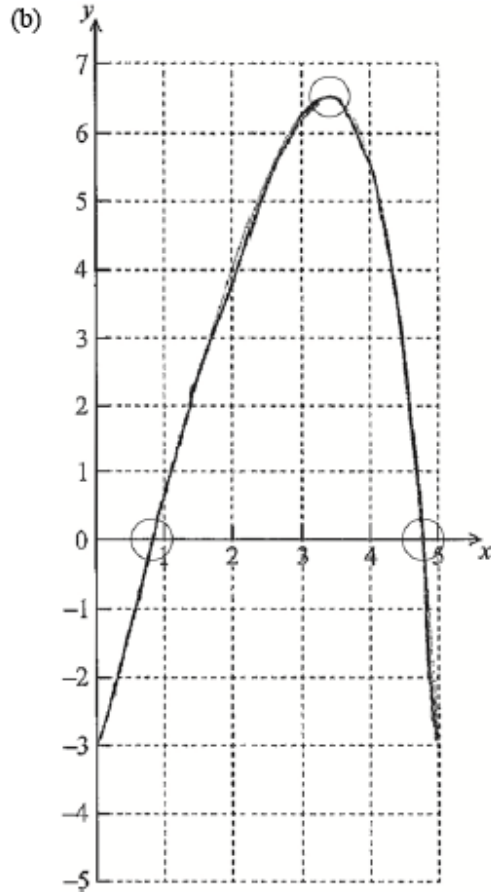(a)   intercepts when $f(x) = 0$ *M1*

(0.827, 0) (4.78, 0) (accept $x = 0.827$ $x = 4.78$)   *A1A1*   *N3*

[3 marks]

(b)

                                                                                                          A1A1A1   *N3*

Note: Award *A1* for maximum point in circle, *A1* for x-intercepts in circles,
     A1 for correct shape (y approximately greater than -3.14).

[3 marks]

7)

(a) $y = \dfrac{2x-1}{x+1}$

interchanging x and y (seen anywhere)   *M1*

e.g. $x = \dfrac{2y-1}{y+1}$

correct working   *A1*
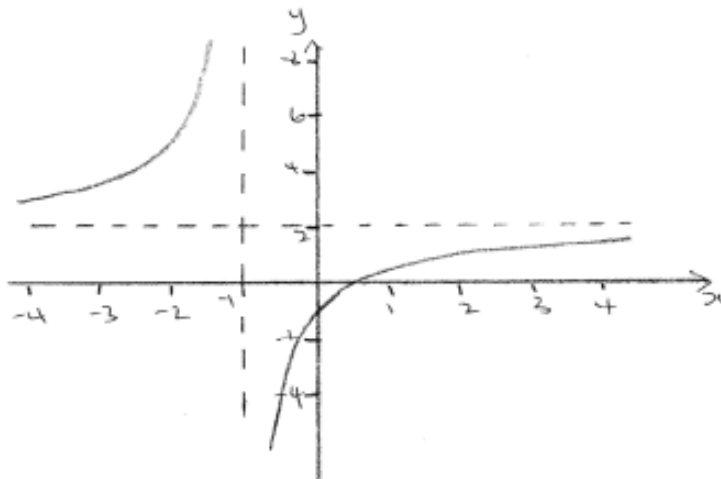e.g. $xy + x = 2y - 1$

collecting terms   *A1*
e.g. $x + 1 = 2y - xy, \ x + 1 = y(2-x)$

$h^{-1}(x) = \dfrac{x+1}{2-x}$ *A1*   *N2*

[4 marks]

(b) (i)

A1A1A1A1   *N4*

Note: Award *A1* for approximately correct intercepts,
      A1 for correct shape, *A1* for asymptotes,
      A1 for approximately correct domain and range.

(ii) $x = -1, \ y = 2$ *A1A1*   *N2*

(iii) $\dfrac{1}{2}$ *A1*   *N1*

[7 marks]

Function test ANS