C3 – Jan 13

9. (a) (i) $D(fg) = (0, \infty)$ B1

(ii) $R(fg) = [a, b)$ with

$a = -25$ B1

$b = \infty$ B1

(iii) $fg(x) = (2x - 3)^2 - 25$ B1

(iv) Putting candidate's expression for $fg(x)$ equal to 0 and using a correct method to try and solve the resulting quadratic in x M1

$x = 4, x = -1.$ (c.a.o.) A1

$x = 4$ (c.a.o.) A1

(b) (i) $$hh(x) = \frac{2 \times \frac{2x + 7}{5x - 2} - 7}{5 \times \frac{2x + 7}{5x - 2} - 2}$$ M1

$$hh(x) = \frac{4x + 14 - 35x + 14}{10x + 35 - 10x + 4}$$

$hh(x) = x$ (convincing) A1

(ii) $h^{-1}(x) = h(x)$ B1

C3 – Jan 13

7. (a) Trying to solve either $3x - 4 = 5$ or $3x - 4 = -5$ M1

$3x - 4 = 5 \Rightarrow x = 3$

$3x - 4 = -5 \Rightarrow x = -\frac{1}{3}$ (both inequalities) A1

Required range: $x \leqslant -\frac{1}{3}$ or $x \geqslant 3$ (f.t. one slip) A1

Alternative mark scheme

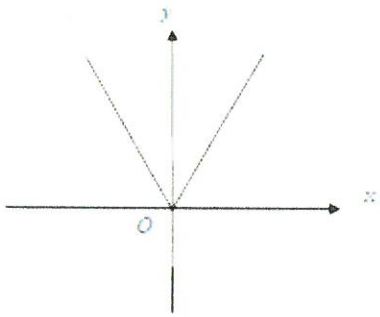
$(3x - 4)^2 = 25$

(squaring both sides, forming and trying to solve quadratic) M1

Critical values $x = -\frac{1}{3}$ and $x = 3$ A1

Required range: $x \leqslant -\frac{1}{3}$ or $x \geqslant 3$ (f.t. one slip in critical values) A1

(b) (i)



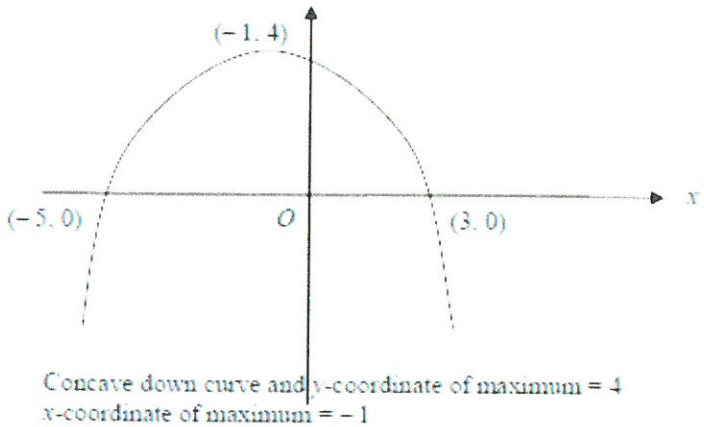
G1

(ii) $a = -2$ B1

$b = -4$ B1

C3 – May 13

9.



Concave down curve and y-coordinate of maximum = 4	B1
x-coordinate of maximum = – 1	B1
Both points of intersection with x-axis	B1

C3 – Functions Homework (Due 09/03/16)

C3 – Jan 06

9. (a) Domain is $(2, \infty)$ B1

(b) $(fg(x) = 5)$

$e^{\ln(x^2-4)} = 5$ $= 5$

M1 (correct order)

$x^2 - 4 = 5$
or
$\ln(x^2 - 4) = \ln 5$ A1 (either)

$x^2 = 9$ A1
$x = 3$ (-3 not in domain) A1 (with reason)

C3 – May 13

11. (a) (i) $D(fg) = (0, \pi 4]$ B1

(ii) $R(fg) = (-\infty, 0]$ B1 B1

(b) (i) $fg(x) = -0.4 \Rightarrow \tan x = e^{-0.4}$ M1
$x = 0.59$ A1

(ii) Equation has solution only if $k \in R(fg)$.
$\therefore$ choose any $k \in R(fg)$ (f.t. candidate's $R(fg)$) B1

C3 – Jan 13

8. (a) $y + 2 = \ln(4x + 5)$ B1

An attempt to express candidate's equation as an exponential equation M1

$x = \frac{(e^{y+2} - 5)}{4}$ (f.t. one slip) A1

$f^{-1}(x) = \frac{(e^{x+2} - 5)}{4}$ (f.t. one slip) A1

(b) $D(f^{-1}) = [-2, \infty)$ B1

C3 – May 13

10. (a) $y - 6 = e^{5-x/2}$ B1

An attempt to express equation as a logarithmic equation and to isolate x M1

$x = 2[5 - \ln(y - 6)]$ (c.a.o.) A1

$f^{-1}(x) = 2[5 - \ln(x - 6)]$

(f.t. one slip in candidate's expression for x) A1

(b) $D(f^{-1}) = [7, \infty)$ B1 B1