

Higher Mathematics

Domain - Solutions - 2013-2017

Marks are indicated in brackets after each question number

2013 Paper 1 Question 13, (2)

$$\text{Let } x^2 - 7x + 12 = 0$$

$$(x - 4)(x - 3) = 0$$

$$x = 3, x = 4$$

So $x = 3, x = 4$ cannot be in the domain of $f(x)$

2014 Paper 1 Question 12, (2)

$$f(x) = \frac{6x}{x^2 + 6x - 16}$$

Restrictions on the domain of $f(x)$ occur where $x^2 + 6x - 16 = 0$ since we cannot divide by 0

$$\text{Let } x^2 + 6x - 16 = 0$$

$$(x + 8)(x - 2) = 0$$

$$x = -8, x = 2$$

So, the restrictions on the domain of f are $x = -8, x = 2$

2015 Paper 2 Question 2, (2) (3) (2)

$$\begin{aligned} \text{a) } f(g(x)) &= f((1+x)(3-x) + 2) \\ &= 10 + (1+x)(3-x) + 2 \end{aligned}$$

Simplifying gives

$$f(g(x)) = 15 + 2x - x^2$$

$$\begin{aligned} \text{b) } f(g(x)) &= -x^2 + 2x + 15 \\ &= -(x^2 - 2x) + 15 \end{aligned}$$

Completing the square of the inside of the bracket

$$= - \left[(x - 1)^2 - 1 \right] + 15$$

$$= - (x - 1)^2 + 16$$

$$\text{c) } h(x) = \frac{1}{f(g(x))} = \frac{1}{-(x - 1)^2 + 16}$$

Restrictions on the domain of $h(x)$ occur where $-(x - 1)^2 + 16 = 0$

$$\text{Let } -(x - 1)^2 + 16 = 0$$

$$(x - 1)^2 = 16$$

$$x - 1 = 4 \quad x - 1 = -4$$

$$x = 5 \quad x = -3$$

So, $x = -3$, $x = 5$ cannot be in the domain of $h(x)$