

MATH 1115 - Fundamental Mathematics for the General Sciences I

ASSIGNMENT 3 (GROUP 1) ¹

- To be submitted by **4 p.m.** on **Thursday, 13th. October, 2016** in the Department of Mathematics and Statistics (**BOX labelled MATH 1115 G1**). Late assignments will be deducted 50% of achieved mark. **Assignments submitted more than 24 hours late will be awarded a mark of zero.**
- On your script, please include in the following order: **Course code and Group number, Assignment number, Name, ID number and Instructor's name (Ms. L. Addison)**. For example, Math 1115 G4, Assignment #3, Jane Doe, 81009672, Ms. L. Addison.
- Please ensure that you submit your script in the appropriate box in the department, labelled FOR YOUR GROUP of Math 1115.
- Attempt ALL questions, showing ALL working where applicable.
- Note that a selection of the questions will be marked, not necessarily all. A markscheme is shown for each question in the right hand corner.

Determine (a) $f \circ g(x)$ and (b) $g \circ f(x)$ for each of the following.

1. $f(x) = 2x - 1, g(x) = -x$ [6]

2. $f(x) = x + 2, g(x) = x^2$ [6]

3. $f(x) = 3x - 1, g(x) = x^2 + 2x - 1$ [7]

4. $f(x) = \frac{1}{2x}, g(x) = 2x + 3$. Specify the domain of each composite function. [8]

5. $f(x) = \frac{1}{x-1}, g(x) = \frac{1}{x}$. Specify the domain of each composite function. [8]

6. Given that $f(x) = 2x - 3$ and $g(x) = (x + 1)^2$, determine:

(a) $f(-3)$ (b) $g(-4)$ (c) $f \circ g(x)$ (d) $g \circ f(x)$ (e) $f^{-1}(x)$ and $f^{-1}(15)$ (f) $g \circ f^{-1}(x)$ and $g \circ f^{-1}(15)$ [16]

7. Given that $f(x) = \frac{2x-1}{2}, g(x) = 1 - 2x$ and $h(x) = 2x^2 - 1$, determine $f \circ g \circ h(x)$. [9]

8. For the functions in $f(x)$ and $g(x)$ in Question 7, show that (i) $(f \circ g)^{-1}(x) = g^{-1} \circ f^{-1}(x)$ and (ii) $(g \circ f)^{-1}(x) = f^{-1} \circ g^{-1}(x)$ [8]

Note: In the above questions, $f^{-1}(x)$ denotes the inverse function of f , $g^{-1}(x)$ denotes the inverse function of g , $(f \circ g)^{-1}(x)$ denotes the inverse of the composite function $(f \circ g)(x)$ and $(g \circ f)^{-1}(x)$ denotes the inverse of the composite function $(g \circ f)(x)$.

9. Express $\frac{1 - \sqrt{3}}{2 + \sqrt{3}}$ in the form $x + y\sqrt{3}$, where $x, y \in \mathbb{Q}$. [5]

10. Show that:

(a) $\frac{\sqrt{7} - \sqrt{2}}{\sqrt{7} + \sqrt{2}} = \frac{1}{5}(9 - 2\sqrt{14})$ [4]

(b) $\frac{\sqrt{7} - \sqrt{2}}{\sqrt{7} + \sqrt{2}} - \frac{\sqrt{7} + \sqrt{2}}{\sqrt{7} - \sqrt{2}} = -\frac{4\sqrt{14}}{5}$ [7]

11. Express the following, in the form $k\sqrt{7}$, where k is an integer.

(a) $\sqrt{28} + \sqrt{252}$. (b) $\sqrt{175} - \sqrt{63}$ [6]

END OF ASSIGNMENT

¹For soft-copy of this assignment visit: <http://tinyurl.com/js44qrv> (check the 'Resources' tab)