Exercises for section 12.4

Ex 1.

$g \circ f : A \to C$ defined as $g \circ f = \{(5,1),(6,1),(8,1)\}$

Ex 2.

$g \circ f : A \to C$ defined as $g \circ f = \{(1,1),(2,1),(3,3),(4,1)\}$

Ex 3.

$g \circ f : A \to A$ defined as $g \circ f = \{(1,1),(2,1),(3,3)\}$

$f \circ g : A \to A$ defined as $f \circ g = \{(1,1),(2,2),(3,2)\}$

Ex 4.

$g \circ f : A \to A$ defined as $g \circ f = \{(a,c),(b,c),(c,c)\}$

$f \circ g : A \to A$ defined as $f \circ g = \{(a,c),(b,c),(c,c)\}$

Ex 5.

$g \circ f : \mathbb{R} \to \mathbb{R}$ defined as $g \circ f(x) = g(f(x)) = g(\sqrt[3]{x+1}) = \left(\sqrt[3]{x+1}\right)^3 = x+1$

$f \circ g : \mathbb{R} \to \mathbb{R}$ defined as $f \circ g(x) = f(g(x)) = f(x^3) = \sqrt[3]{x^3+1}$

Ex 6.

$g \circ f : \mathbb{R} \to \mathbb{R}$ defined as $g \circ f(x) = g(\dfrac{1}{x^2+1}) = \dfrac{3}{x^2+1} + 2$

$f \circ g : \mathbb{R} \to \mathbb{R}$ defined as $f \circ g(x) = f(g(x)) = f(3x+2) = \dfrac{1}{(3x+2)^2+1}$

Ex 7.

$g \circ f : \mathbb{Z} \times \mathbb{Z} \to \mathbb{Z} \times \mathbb{Z}$ defined as $g \circ f(m,n) = g(f(m,n)) = g(mn, m^2) = (mn+1, mn+m^2)$

$f \circ g : \mathbb{Z} \times \mathbb{Z} \to \mathbb{Z} \times \mathbb{Z}$ defined as $f \circ g(m,n) = f(g(m,n)) = f(m+1, m+n) = ((m+1)(m+n), (m+1)^2)$

Ex 8.

$g \circ f : \mathbb{Z} \times \mathbb{Z} \to \mathbb{Z} \times \mathbb{Z}$ defined as $g \circ f(m,n) = g(f(m,n)) = g(3m-4n, 2m+n) = (5(3m-4n)+(2m+n), 3m-4n)$

$f \circ g : \mathbb{Z} \times \mathbb{Z} \to \mathbb{Z} \times \mathbb{Z}$ defined as $f \circ g(m,n) = f(g(m,n)) = f(5m+n, m) = (3(5m+n)-4m, 2(5m+n)+m)$

Ex 9.

$g \circ f : \mathbb{Z} \times \mathbb{Z} \to \mathbb{Z} \times \mathbb{Z}$ defined as $g \circ f(m,n) = g(f(m,n)) = g(m+n) = (m+n, m+n)$

$f \circ g : \mathbb{Z} \to \mathbb{Z}$ defined as $f \circ g(m) = f(g(m)) = f(m,m) = m+m$

Ex 10.

$f \circ f : \mathbb{R}^2 \to \mathbb{R}^2$ defined as $f \circ f(x,y) = f(f(x,y)) = f(xy, x3) = (x^4 y, x^3 y^3)$