



## Sets &amp; Functions

2008 PI	<p>17. A function <math>f</math> is given by <math>f(x) = \sqrt{9 - x^2}</math>.</p> <p>What is a suitable domain of <math>f</math>?</p> <p>A <math>x \geq 3</math> B <math>x \leq 3</math> C <math>-3 \leq x \leq 3</math> D <math>-9 \leq x \leq 9</math></p>	2
Ans	C	
2008 PI	<p>23. Functions <math>f</math>, <math>g</math> and <math>h</math> are defined on suitable domains by</p> $f(x) = x^2 - x + 10, g(x) = 5 - x \text{ and } h(x) = \log_2 x.$ <p>(a) Find expressions for <math>h(f(x))</math> and <math>h(g(x))</math>.</p>	3
Ans	<p>(a) <math>h(f(x)) = \log_2(x^2 - x + 10)</math> <math>h(g(x)) = \log_2(5 - x)</math></p>	
2007 PI	<p>3. Functions <math>f</math> and <math>g</math>, defined on suitable domains, are given by <math>f(x) = x^2 + 1</math> and <math>g(x) = 1 - 2x</math>.</p> <p>Find:</p> <p>(a) <math>g(f(x))</math>; (b) <math>g(g(x))</math>.</p>	2 2
Ans	<p>(a) <math>g(f(x)) = -2x^2 - 1</math> (b) <math>g(g(x)) = 4x - 1</math></p>	
2006 PI	<p>3. Two functions <math>f</math> and <math>g</math> are defined by <math>f(x) = 2x + 3</math> and <math>g(x) = 2x - 3</math>, where <math>x</math> is a real number.</p> <p>(a) Find expressions for:</p> <p>(i) <math>f(g(x))</math>; (ii) <math>g(f(x))</math>.</p> <p>(b) Determine the least possible value of the product <math>f(g(x)) \times g(f(x))</math>.</p>	3 2
Ans	<p>(a) <math>f(g(x)) = 2(2x - 3) + 3</math> <math>g(f(x)) = 2(2x + 3) - 3</math></p> <p>(b) <math>16x^2 - 9</math> minimum value = <math>-9</math></p>	

2005 PI	<p>4. Functions <math>f(x) = 3x - 1</math> and <math>g(x) = x^2 + 7</math> are defined on the set of real numbers.</p> <p>(a) Find <math>h(x)</math> where <math>h(x) = g(f(x))</math>.</p> <p>(b) (i) Write down the coordinates of the minimum turning point of <math>y = h(x)</math>.</p> <p>(ii) Hence state the range of the function <math>h</math>.</p>	2
Ans	<p>(a) <math>(3x - 1)^2 + 7</math></p> <p>(b) (i) <math>\left(\frac{1}{3}, 7\right)</math></p> <p>(ii) <math>y \geq 7</math></p>	
2003 PI	<p>9. Functions <math>f(x) = \frac{1}{x - 4}</math> and <math>g(x) = 2x + 3</math> are defined on suitable domains.</p> <p>(a) Find an expression for <math>h(x)</math> where <math>h(x) = f(g(x))</math>.</p> <p>(b) Write down any restriction on the domain of <math>h</math>.</p>	2 1
Ans	<p>(a) <math>\frac{1}{2x - 1}</math></p> <p>(b) <math>x \neq \frac{1}{2}</math></p>	
2002W PI	<p>9. The function <math>f</math>, defined on a suitable domain, is given by <math>f(x) = \frac{3}{x + 1}</math>.</p> <p>(a) Find an expression for <math>h(x)</math> where <math>h(x) = f(f(x))</math>, giving your answer as a fraction in its simplest form.</p> <p>(b) Describe any restriction on the domain of <math>h</math>.</p>	3 1
Ans	<p>(a) <math>\frac{3(x + 1)}{x + 4}</math></p> <p>(b) <math>x \neq -4</math></p>	
2002 PI	<p>3. Functions <math>f</math> and <math>g</math> are defined on suitable domains by <math>f(x) = \sin(x^\circ)</math> and <math>g(x) = 2x</math>.</p> <p>(a) Find expressions for:</p> <p>(i) <math>f(g(x))</math>;</p> <p>(ii) <math>g(f(x))</math>.</p>	2
Ans	<p>(a) (i) <math>\sin(2x^\circ)</math></p> <p>(ii) <math>2 \sin(x^\circ)</math></p>	
2001 PI	<p>7. Functions <math>f(x) = \sin x</math>, <math>g(x) = \cos x</math> and <math>h(x) = x + \frac{\pi}{4}</math> are defined on a suitable set of real numbers.</p> <p>(a) Find expressions for:</p> <p>(i) <math>f(h(x))</math>;</p> <p>(ii) <math>g(h(x))</math>.</p>	2
Ans	<p>(a) (i) <math>\sin\left(x + \frac{\pi}{4}\right)</math>;</p> <p>(ii) <math>\cos\left(x + \frac{\pi}{4}\right)</math></p>	

<i>2000 P2</i>	<p><b>3.</b> <math>f(x) = 3 - x</math> and <math>g(x) = \frac{3}{x}</math>, <math>x \neq 0</math>.</p> <p>(a) Find <math>p(x)</math> where <math>p(x) = f(g(x))</math>.</p> <p>(b) If <math>q(x) = \frac{3}{3-x}</math>, <math>x \neq 3</math>, find <math>p(q(x))</math> in its simplest form.</p>	2 3
<i>Ans</i>	<p>(a) <math>3 - \frac{3}{x}</math></p> <p>(b) <math>x</math></p>	
<i>Specimen 2 P1</i>	<p><b>8.</b> Functions <math>f</math> and <math>g</math> are defined on the set of real numbers by</p> $f(x) = x - 1$ $g(x) = x^2.$ <p>(a) Find formulae for</p> <p>(i) <math>f(g(x))</math></p> <p>(ii) <math>g(f(x))</math>.</p>	3
	<p>(a) <math>f(g(x)) = x^2 - 1</math>, <math>g(f(x)) = (x - 1)^2</math></p>	