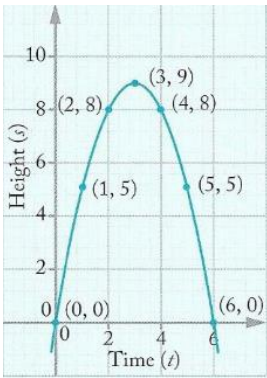
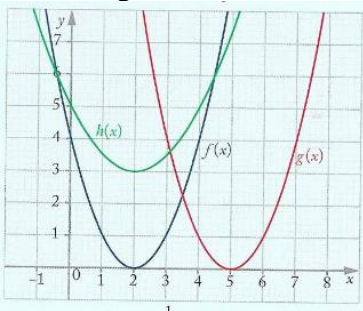


**Topic:** Functions & Graphs in Book 1 (Topics 45 to 49)

<p><b>Q1.</b> If the function <math>f(x) = \frac{2}{3-2x}</math>, where <math>x</math> is real and <math>x \neq \frac{3}{2}</math>, find the inverse function <math>f^{-1}(x)</math>. <b>Ans:</b> <math>f^{-1}(x) = \frac{3}{2} - \frac{1}{x}</math></p>	<p><b>Q2.</b> <math>f: x \rightarrow \frac{x^2+1}{2x}</math> is defined for all <math>x \in R \setminus \{0\}</math>.                      (i) Show that if <math>ab = 1, a \neq b</math>, then <math>f(a) = f(b)</math>.                      (ii) Is <math>f</math> injective? Give a reason. <b>Ans:</b> No</p>
<p><b>Q3.</b> <math>f: x \rightarrow 2a^2 - 2ab + b^2 - 2ax + x^2</math>, where <math>a</math> and <math>b</math> are constants, is a function defined for all <math>x \in R</math>.                      (i) Show that <math>f(a-k) = f(a+k)</math>, for all <math>k \in R</math>. (ii) Is <math>f</math> injective? Give a reason.  <b>Ans:</b> No</p>	<p><b>Q4.</b> <math>f: x \rightarrow 2x + 1</math> is defined for all <math>x \in R</math>. Show that <math>f(f(x) + x) = 3f(x)</math>.  <b>Q5.</b> <math>f(x) = 3x + k</math> and <math>g(x) = \frac{5x-4}{2}</math>. Find the value of <math>k</math> for which <math>f(g(x)) = g(f(x))</math>. <b>Ans:</b> <math>k = -\frac{8}{3}</math></p>
<p><b>Q6.</b> The function <math>f: x \rightarrow x^2 + 2</math> has a domain of <math>0 \leq x \leq 2, x \in R</math> and its codomain is equal to its range. (i) Explain why <math>f</math> is bijective. (ii) Find an expression for <math>f^{-1}(x)</math>.  <b>Ans:</b> (ii) <math>f^{-1}(x) = \sqrt{x-2}</math></p>	<p><b>Q9.</b> The graph shows the flight path of a missile thrown upwards with an initial speed. The graph shows the height (<math>s</math>), measured in metres, reached by the missile as time (<math>t</math>), measured in seconds, varies.</p>  <p>Given that <math>s(t) = at^2 + bt + c</math>, find the value of <math>a, b</math> and <math>c</math>. <b>Ans:</b> <math>a = -1, b = 6, c = 0</math></p>
<p><b>Q7.</b> Write the function <math>g(x) = 3x^2 - 9x - 7</math> in the form <math>p(x+a)^2 + b</math>, and hence find the minimum value of <math>g(x)</math> and the equation of the axis of symmetry.  <b>Ans:</b> <math>g(x) = 3(x - \frac{3}{2})^2 - \frac{55}{4}</math>                      Min Value = <math>-\frac{55}{4}</math> Axis of symmetry: <math>x = \frac{3}{2}</math></p>	<p><b>Q11.</b> Find the inverse of the following functions:                      (i) <math>f(x) = \sqrt{2x-6}</math>                      (ii) <math>g(x) = x^2 - 4x, x \geq 2, x \in R</math>                      In the case of (i), state the domain and range of the inverse function of <math>f(x)</math>.                      In the case of (ii), why, do you think, was the domain confined to <math>x \geq 2, x \in R</math>?  <b>Ans:</b> (i) <math>f^{-1}(x) = \frac{x^2+6}{2}</math> Domain: <math>x \geq 0, x \in R</math>                      Range: <math>f^{-1}(x) \geq 3, f^{-1}(x) \in R</math>                      (ii) <math>g^{-1}(x) = 2 + \sqrt{x+4}</math> Domain is confined to <math>x \geq 2</math> so that <math>g^{-1}(x)</math> will be a function.</p>
<p><b>Q8.</b> If <math>f(x) = -5x + 7, g(x) = \sqrt{2x-4}</math> and <math>h(x) =  2x+3  + 9</math> and <math>g(x) = -x^2</math>, find:                      (i) <math>fgh(-2)</math> (ii) <math>hgf(1)</math> (iii) <math>fgh(k)</math>  <b>Ans:</b> (i) <math>-13</math> (ii) <math>12</math> (iii) <math>-5\sqrt{ 4k+6 } + 14 + 7</math></p>	<p><b>Q12.</b> <math>f</math> is a function defined by <math>f(x) = x^2 - 6x + 11</math> where <math>x \geq 3</math>.                      (i) Express <math>f(x)</math> in <math>a + (x+b)^2</math>                      (ii) State the range of <math>f(x)</math>                      (iii) Write down the domain of <math>f^{-1}(x)</math>.  <b>Ans:</b> (i) <math>f(x) = (x-3)^2 + 2</math>                      (ii) <math>f(x) \geq 2, f(x) \in R</math>                      (iii) <math>f^{-1}(x) = 3 + \sqrt{x-2}</math> so <math>\Rightarrow x \geq 2, x \in R</math></p>
<p><b>Q10.</b> The functions <math>g(x)</math> and <math>h(x)</math> are transformations of the function <math>f(x) = (x-2)^2</math>. From the diagram below find the equation for <math>g(x)</math> and <math>h(x)</math>.</p>  <p><b>Ans:</b> <math>g(x) = (x-5)^2</math> and <math>h(x) = 0.5(x-2)^2 + 3</math></p>	