

## E Summer Functions

1. If  $f(x) = 2x + 3$  find (fully simplified):

(a) $f(1)$ ,	<input type="text" value="5"/>	(c) $f(x + 1)$ ,	<input type="text" value="2x + 5"/>
(b) $f(\frac{1}{2})$ ,	<input type="text" value="4"/>	(d) $f(1 - 3x)$ .	<input type="text" value="5 - 6x"/>

2. If  $g(x) = 2x^2 - x + 1$  find (fully simplified):

(a) $g(5)$ ,	<input type="text" value="46"/>	(d) $g(x + 1)$ ,	<input type="text" value="2x^2 + 3x + 2"/>
(b) $g(-2)$ ,	<input type="text" value="11"/>	(e) $g(x^2 - 1)$ ,	<input type="text" value="2x^4 - 5x^2 + 4"/>
(c) $g(\frac{2}{3})$ ,	<input type="text" value="11/9"/>	(f) $g(\sqrt{x})$ .	<input type="text" value="2x - \sqrt{x} + 1"/>

3. If  $h(x) = \frac{2}{3+x}$  find (fully simplified):

(a) $h(7)$ ,	<input type="text" value="1/5"/>	(d) $h(\frac{1}{x})$ ,	<input type="text" value="2x / (3x+1)"/>
(b) $h(-\frac{1}{2})$ ,	<input type="text" value="4/5"/>	(e) $h(\frac{7}{x-8})$ .	<input type="text" value="(2x-16) / (3x-17)"/>
(c) $h(x - 3)$ ,	<input type="text" value="2/x"/>	(f) $h(\frac{ax}{4-bx})$ .	<input type="text" value="(8-2bx) / (12-3bx+ax)"/>

4. If  $l(x) = \frac{1+2x}{2-3x}$  find (fully simplified):

(a) $l(-3)$ ,	<input type="text" value="-5/11"/>	(d) $l(\frac{1}{x})$ ,	<input type="text" value="(x+2) / (2x-3)"/>
(b) $l(\frac{1}{4})$ ,	<input type="text" value="6/5"/>	(e) $l(\frac{x}{x+1})$ ,	<input type="text" value="(3x+1) / (2-x)"/>
(c) $l(x + 1)$ ,	<input type="text" value="(-2x+3) / (5x+1)"/>	(f) $l(\frac{x-1}{x-2})$ .	<input type="text" value="(4-3x) / (1+x)"/>

5. If  $f(x) = 2x - 3$ ,  $g(x) = x^2 + x$  and  $h(x) = \frac{1}{x+1}$  solve the following:

(a) $f(x) = 3$ ,	<input type="text" value="x = 3"/>	(e) $gf(x) = 0$ ,	<input type="text" value="x = 1 or x = 3/2"/>
(b) $f(x + 3) = 8$ ,	<input type="text" value="x = 5/2"/>	(f) $fh(x) = -1$ ,	<input type="text" value="x = 0"/>
(c) $ff(x) = 2x - 1$ ,	<input type="text" value="x = 10/3"/>	(g) $fg(x) = -3$ ,	<input type="text" value="x = 0 or x = -1"/>
(d) $hf(x) = 7$ ,	<input type="text" value="x = 15/14"/>		

6. If  $f(x) = x + 1$ ,  $g(x) = x^2$  and  $h(x) = \frac{1}{x}$  solve the following:

(a) $f(x) = 2$ ,	<input type="text" value="x = 1"/>	(e) $hf(x) = x$ ,	<input type="text" value="x = (-1 ± \sqrt{5}) / 2"/>
(b) $f(x + 3) = -\frac{1}{2}$ ,	<input type="text" value="x = -9/2"/>	(f) $gf(x) = 1$ ,	<input type="text" value="x = 0 or x = -2"/>
(c) $ff(x) = 2x - 1$ ,	<input type="text" value="x = -3"/>	(g) $fh(x) = 0$ ,	<input type="text" value="x = -1"/>
(d) $fff(x) = 2x + 6$ ,	<input type="text" value="x = -3"/>	(h) $fg(x) = 2$ ,	<input type="text" value="x = 1 or x = -1"/>

7. If  $f(x) = 2x + 1$ ,  $g(x) = x^2 + x$  and  $h(x) = \frac{1}{x}$ , find fully simplified expressions for:

(a) $fg(x)$ .	<input type="text" value="2x^2 + 2x + 1"/>	(e) $ff(x)$ .	<input type="text" value="4x + 3"/>
(b) $gf(x)$ .	<input type="text" value="4x^2 + 6x + 2"/>	(f) $fff(x)$ .	<input type="text" value="8x + 7"/>
(c) $hf(x)$ .	<input type="text" value="1 / (2x+1)"/>	(g) $gg(x)$ .	<input type="text" value="x^4 + 2x^3 + 2x^2 + x"/>
(d) $hfg(x)$ .	<input type="text" value="1 / (2x^2 + 2x + 1)"/>	(h) $hh(x)$ .	<input type="text" value="x"/>

8. Find the natural domain of the following functions:

(a) $f(x) = -x + 7.$	$x \in \mathbb{R}$	(f) $f(x) = \sqrt{1 - 4x}.$	$x \leq \frac{1}{4}$
(b) $f(x) = x^2 - 2x + 1.$	$x \in \mathbb{R}$	(g) $f(x) = \frac{x+1}{x-1}.$	$x \neq 1$
(c) $f(x) = \frac{1}{x}.$	$x \neq 0$	(h) $f(x) = \frac{ax+b}{cx+d}.$	$x \neq -\frac{d}{c}$
(d) $f(x) = \sqrt{x - 6}.$	$x \geq 6$	(i) $f(x) = \frac{\sqrt{7-3x}}{x+3}.$	$x \leq \frac{7}{3}$ and $x \neq -3$
(e) $f(x) = \sqrt{2x + 1}.$	$x \geq -\frac{1}{2}$		

9. Find the inverses of the following functions:

(a) $f(x) = 2x - 1.$	$f^{-1}(x) = \frac{x+1}{2}$	(g) $f(x) = \frac{2-3x}{1+5x}.$	$f^{-1}(x) = \frac{2-x}{3+5x}$
(b) $f(x) = \frac{1}{x}.$	$f^{-1}(x) = \frac{1}{x}$	(h) $f(x) = 1 + \frac{3x}{1-x}.$	$f^{-1}(x) = \frac{x-1}{x+2}$
(c) $f(x) = ax + b.$	$f^{-1}(x) = \frac{x-b}{a}$	(i) $f(x) = 5 - \frac{3}{x-2}.$	$f^{-1}(x) = \frac{2x-13}{x-5} = 2 + \frac{3}{5-x}$
(d) $f(x) = \sqrt{2-x}.$	$f^{-1}(x) = 2 - x^2$	(j) $f(x) = a + \frac{1+x}{1-ax}.$	$f^{-1}(x) = \frac{x-a-1}{1+ax-a^2}$
(e) $f(x) = \frac{1}{1+x}.$	$f^{-1}(x) = \frac{1}{x} - 1 = \frac{1-x}{x}$	(k) $f(x) = \frac{ax+b}{cx+d}.$	$f^{-1}(x) = \frac{b-dx}{cx-a} = \frac{dx-b}{a-cx}$
(f) $f(x) = \frac{1+x}{1-x}.$	$f^{-1}(x) = \frac{x-1}{x+1}$	(l) $f(x) = \sqrt{\frac{ax+x+c}{x-c}}.$	$f^{-1}(x) = \frac{c(1+x^2)}{x^2-a-1}$

10. The following functions are self-inverse (i.e.  $f(x) \equiv f^{-1}(x)$  and  $ff(x) = x$ ). Find conditions on the constants for this to be true:

(a) $f(x) = x + a.$	$a = 0$	(b) $f(x) = \frac{x+a}{x-3}.$	$\square$
---------------------	---------	-------------------------------	-----------