EXERCISE A

Find $(f + g)(x)$, $(f - g)(x)$ and $(f \cdot g)(x)$.

1) $f(x) = 3x + 4$
    $g(x) = 5 + x$

2) $f(x) = x^2 + 3$
    $g(x) = x - 4$

For each pair of functions, find $f \circ g$ and $g \circ f$., if they exist.

3) $f = \{(-1, 9), (4, 7)\}$
    $g = \{(-5, 4), (7, 12), (4, -1)\}$

4) $f = \{(0, -7), (1, 2), (2, -1)\}$
    $g = \{(-1, 10), (2, 0)\}$

Find $[g \circ h](x)$ and $[h \circ g](x)$.

5) $g(x) = 2x$
    $h(x) = 3x - 4$

6) $g(x) = x + 5$
    $h(x) = x^2 + 6$

Use the three functions in the text box to the right to find each value.

$f(x) = 3x$	
$g(x) = x + 7$	
$h(x) = x^2$	

7) $f[g(3)]$

8) $[g \circ h](-2)$

9) $h[h(1)]$

10) $h(g(-11))$

11) $[g \circ f](-2.5)$

12) $h(f(g(-4)))$

EXERCISE B

Find $(f + g)(x)$, $(f - g)(x)$ and $(f \cdot g)(x)$.

13) $f(x) = x + 9$
     $g(x) = x - 9$

14) $f(x) = 2x - 3$
     $g(x) = 4x + 9$

15) $f(x) = 2x^2$
     $g(x) = 8 - x$

16) $f(x) = x^2 + 6x + 9$
     $g(x) = 2x + 6$

For each pair of functions, find $j \circ k$ and $k \circ j$.

17) $j = \{(1,1), (0,-3)\}$
     $k = \{(1,0), (-3,1), (2,1)\}$

18) $j = \{(3,8), (4,0), (6,3), (7,-1)\}$
     $k = \{(0,4), (8,6), (3,6), (-1,8)\}$

19) $j = \{(4,5), (6,5), (8,12), (10,12)\}$
     $k = \{(4,6), (2,4), (6,8), (8,10)\}$

Find $[g \circ h](x)$ and $[h \circ g](x)$.

20) $g(x) = 4x$
     $h(x) = 2x - 1$

21) $g(x) = x + 2$
     $h(x) = x^2$

22) $g(x) = 2x$
     $h(x) = x^3 + x^2 + x + 1$

Use the three functions in the text box to the right to find each value.

$f(x) = 4x$
$g(x) = 2x - 1$
$h(x) = x^2 + 1$

23) $f[g(-1)]$

24) $g[f(5)]$

25) $g(g(7))$

26) $h(f(1/4))$

27) $[f \circ (h \circ g)](3)$

28) $[f \circ (g \circ h)](2)$

EXERCISE C

29) From 1990 to 2002, the number of births $b(x)$ in the United States can be modeled by the function: $b(x) = -8x + 4045$. The number of deaths can be modeled by the function: $d(x) = 24x + 2160$, where x is the number of years since 1990, and $b(x)$ and $d(x)$ are in thousands (of people).

a) The net increase in population P, is the number of births per year minus the number of deaths, or $P(x) = b(x) - d(x)$. Write an expression to model $P(x)$.

b) Assuming the birth and death rates continue at the same rates, estimate the net increase in population in 2015. Remember, $P(x)$ is in thousands.

ANSWERS:

1)	$4x + 9$	11)	-0.5	19)	$\{(4,5), (2,5), (6,12), (8,12)\}$
	$2x - 1$	13)	$2x$		does not exist
	$3x^2 + 19x + 20$		18	21)	$x^2 + 2$
3)	$\{(-5,7), (4,9)\}$		$x^2 - 81$		$x^2 + 4x + 4$
	$\{(4,12)\}$	15)	$2x^2 - x + 8$	23)	-12
5)	$6x - 8$		$2x^2 + x - 8$	25)	25
	$6x - 4$		$-2x^3 + 16x^2$	27)	104
7)	30	17)	$\{(1,-3), (-3,1), (2,1)\}$	29a)	$P(x) = -32x + 1885$
9)	1		$\{(1,0), (0,1)\}$	29b)	1,085,000