1.2.2

1. Given $f(x) = x - 4$

(a) $f(5) = 5 - 4$
$= 1$

(b) $f(3) = 3 - 4$
$= -1$

2. $g(x) = 2x^2 - 10$

(a) $g(2) = 2(2)^2 - 10$
$= 2(4) - 10$
$= 8 - 10$
$= -2$

(b) $g(-2) = 2(-2)^2 - 10$
$= 8 - 10$
$= -2$

(c) $g(x) = 8$

$2x^2 - 10 = 8$
$\Rightarrow 2x^2 = 8 + 10$
$\Rightarrow x^2 = \frac{18}{2} = 9$
$\Rightarrow x = \pm 3$

3. $f(x) = 3x - 5$

(a) $f(3)$

$f(3) = 3(3) - 5 = 9 - 5 = 4$

(b) $f(-2)$

$f(-2) = 3(-2) - 5 = -6 - 5$
$= -11$

(c) $f(x) = 1$

$\Rightarrow 3x - 5 = 1$
$\Rightarrow 3x = 6$
$\Rightarrow x = \frac{6}{3} = 2$

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4. $f(x) = x^2 - 3$

(a) $f(10)$

$f(10) = (10)^2 - 3$
$= 100 - 3$
$= 97$

(b) $f(-1)$

$f(-1) = (-1)^2 - 3$
$= 1 - 3$
$= -2$

(c) $f^{-1}(x)$

x in terms of y.

$y = x^2 - 3$
$\Rightarrow y + 3 = x^2$
$\Rightarrow x = \pm\sqrt{y+3}$

X ———— o ———— X

5. $f(x) = 2x - 4$ $\qquad g(x) = 3x + 5$

(a) $gf(x) = 3(2x-4)+5 = 6x - 12 + 5$
$= 6x - 7$

$gf(3) = 6(3) - 7 = 18 - 7 = 11$

(b) $f^{-1}(x)$

~~x in t~~
y in terms of x

$y = 2x - 4$
$\Rightarrow y + 4 = 2x$
$\Rightarrow x = \frac{y+4}{2}$
$f^{-1}(x) = \frac{x+4}{2}$

(c) $f(x) = g(x)$

$\Rightarrow 2x - 4 = 3x + 5$
$\Rightarrow 2x - 3x = 5 + 4$
$\Rightarrow -x = 9$
$\Rightarrow x = -9$

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6. $f(x) = 3x+1$ and $g(x) = x^2$

(a) $f(g(x)) = 3(x^2)+1 = 3x^2+1$

(b) $g(f(x)) = (3x+1)^2 = 9x^2+1+6x$

(c) $f(g(x)) = g(f(x))$

$\Rightarrow 3x^2+1 = 9x^2+6x+1$
$\Rightarrow 6x^2+6x = 0$
$\Rightarrow x^2+x = 0$
$\Rightarrow x^2 = -x$
$\Rightarrow x = -1$

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7. $f(x) = x^2 - 17$ and $g(x) = x + 3$

(a) $g^{-1}(x)$

x in terms of y

$y = x + 3$

$\Rightarrow x = y - 3$

$\therefore g^{-1}(x) = x - 3$

(b) $f^{-1}(x)$

x in terms of y

$y = x^2 - 17$

$\Rightarrow x^2 = y + 17$

$\Rightarrow x = \sqrt{y+17}$

$f^{-1}(x) = \pm\sqrt{x+17}$

(c) $f^{-1}(x) = g^{-1}(x)$

$\sqrt{x+17} = x - 3$

$\Rightarrow x + 17 = (x-3)^2$

$\Rightarrow x + 17 = x^2 + 9 - 6x$

$\Rightarrow 0 = x^2 + 9 - 6x - x - 17$

$\Rightarrow x^2 - 7x - 8 = 0$

$\cancel{\Rightarrow x^2 - 3x - 4x - 8 = 0}$

$\cancel{\Rightarrow x(x-3) \quad (x}$

8. A function f is defined such that

$$f(x) = x^2 - 1$$

(a) Find an expression for : $f(x-2)$

$$f(x-2) = (x-2)^2 - 1$$
$$= x^2 + 2 - 4 - 1 = x^2 - 3$$

(b) Solve : $f(x-2) = 0$

$$x^2 - 3 = 0$$
$$\Rightarrow x^2 = 3$$
$$\Rightarrow x = \pm\sqrt{3}$$

9. $f(x) = 4x - 1$ | $g(x) = kx^2$, k is constant

(a) $f^{-1}(x)$

x in terms of y

let $y = 4x - 1$

$\Rightarrow 4x = y + 1$

$\Rightarrow x = \dfrac{y+1}{4}$

$\Rightarrow f^{-1}(x) = \dfrac{x+1}{4}$

$fg(2) = 12$

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

$= 4kx^2 - 1$

$f(g(2)) = 4k(4) - 1$

$= 16k - 1$

$\Rightarrow 16k - 1 = 12$

$\Rightarrow 16k = 13 \Rightarrow k = \dfrac{13}{16}$