

Penyelesaian Lengkap

Praktis 1

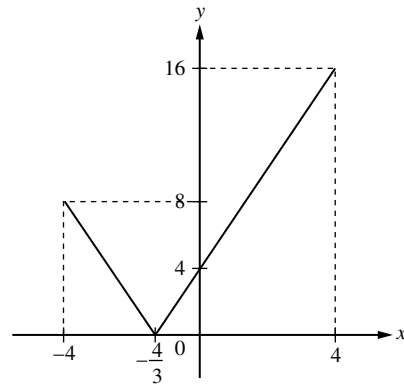
Praktis Formatif

- 1 (a) $\{-1, 2, 4\}$
 (b) $\{(-1, 3), (2, 5), (2, 7), (4, 8)\}$
 (b) Hubungan satu dengan banyak
One-to-many relation
- 2 (a) $-2, 2$
 (b) $\{4, 9\}$
 (c) $f(x) = x^2$ atau/or $f: x \rightarrow x^2$
- 3 (a) $4x + 3 = 0$
 $x = -\frac{3}{4}$
 (b) $f(-3) = \frac{6(-3)}{4(-3) + 3}$
 $= 2$
 (c) $f(x) = 1$
 $\frac{6x}{4x + 3} = 1$
 $6x = 4x + 3$
 $2x = 3$
 $x = \frac{3}{2}$
- 4 $f(x) = px^3 - 9$
 $f(-2) = -13$
 $p(-2)^3 - 9 = -13$
 $-8p - 9 = -13$
 $-8p = -4$
 $p = \frac{1}{2}$
 $f(x) = \frac{1}{2}x^3 - 9$
 $f(3) = q$
 $q = \frac{1}{2}(3)^3 - 9$
 $q = \frac{9}{2}$
 $f(r) = 23$
 $\frac{1}{2}r^3 - 9 = 23$
 $\frac{1}{2}r^3 = 32$
 $r^3 = 64$
 $r = 4$
- 5 (a) $g(3) = |5 - 2(3)|$
 $= |-1|$
 $= 1$
 (b) $g(x) = 7$
 $|5 - 2x| = 7$

$$\begin{array}{ll} 5 - 2x = -7, & 5 - 2x = 7 \\ 2x = 12, & 2x = -2 \\ x = 6, & x = -1 \end{array}$$

6 (a) Pada paksi-x/On the x-axis, $f(x) = 0$
 $3x + 4 = 0$
 $x = -\frac{4}{3}$

Pada paksi-y/On the y-axis, $x = 0$,
 $f(0) = |3(0) + 4|$
 $= 4$
 $f(-4) = |3(-4) + 4|$
 $= 8$
 $f(4) = |3(4) + 4|$
 $= 16$



(b) Julat/Range: $0 \leq y \leq 16$

7 $g(x) = 3x + 4$, $h(x) = \frac{2x}{5 - x}$

(a) $gh(-1) = g\left(\frac{2(-1)}{5 - (-1)}\right)$
 $= g\left(-\frac{1}{3}\right)$
 $= 3\left(-\frac{1}{3}\right) + 4$
 $= 3$

(b) $hg(x) = h(3x + 4)$
 $= \frac{2(3x + 4)}{5 - (3x + 4)}$
 $= \frac{6x + 8}{5 - 3x - 4}$
 $= \frac{6x + 8}{1 - 3x}$, $x \neq \frac{1}{3}$

8 (a) $f(x) = 2x - 1$, $g(x) = x^2 + 3x - 6$
 $gf(x) = g(2x - 1)$
 $= (2x - 1)^2 + 3(2x - 1) - 6$
 $= 4x^2 - 4x + 1 + 6x - 3 - 6$
 $= 4x^2 + 2x - 8$

$$\begin{aligned}
 \text{(b) } gf(x) &= 3g(x) \\
 4x^2 + 2x - 8 &= 3(x^2 + 3x - 6) \\
 4x^2 + 2x - 8 &= 3x^2 + 9x - 18 \\
 x^2 - 7x + 10 &= 0 \\
 (x - 2)(x - 5) &= 0 \\
 x = 2, x = 5
 \end{aligned}$$

$$\begin{aligned}
 \text{9 (a) } f^2(-3) &= ff(-3) \\
 &= f(2(-3)^2 - 3) \\
 &= f(15) \\
 &= 2(15)^2 - 3 \\
 &= 447
 \end{aligned}$$

$$\begin{aligned}
 \text{(b) } f^2(x) &= 47 \\
 ff(x) &= 47 \\
 f(2x^2 - 3) &= 47 \\
 2(2x^2 - 3)^2 - 3 &= 47 \\
 2(2x^2 - 3)^2 &= 50 \\
 (2x^2 - 3)^2 &= 25 \\
 2x^2 - 3 &= -5, & 2x^2 - 3 &= 5 \\
 2x^2 &= -2, & 2x^2 &= 8 \\
 x^2 &\neq -1, & x^2 &= 4 \\
 & & x &= \pm 2
 \end{aligned}$$

$$\text{10 } f(x) = x + 4, g(x) = x^2, h(x) = \frac{3}{x}$$

$$\begin{aligned}
 \text{(a) } fh(x) &= f\left(\frac{3}{x}\right) \\
 &= \frac{3}{x} + 4
 \end{aligned}$$

$$\begin{aligned}
 \text{(b) } gf(x) &= g(x + 4) \\
 &= (x + 4)^2
 \end{aligned}$$

$$\begin{aligned}
 \text{(c) } g^2(x) &= g[g(x)] \\
 &= g(x^2) \\
 &= (x^2)^2 \\
 &= x^4 \\
 g^2(x) &= x^4
 \end{aligned}$$

$$\text{11 } f(x) = 3 - 2x, fh(x) = 12x + 1$$

$$\begin{aligned}
 \text{Biar/Let } h(x) &= y \\
 f(y) &= 12x + 1 \\
 3 - 2y &= 12x + 1 \\
 -2y &= 12x - 2 \\
 y &= 1 - 6x \\
 \therefore h(x) &= 1 - 6x
 \end{aligned}$$

$$\text{12 } f(x) = 3x + 1, gf(x) = \frac{3}{x+2}, x \neq -2$$

$$\begin{aligned}
 \text{Biar/Let } f(x) &= y \\
 3x + 1 &= y \\
 3x &= y - 1 \\
 x &= \frac{y-1}{3} \dots \textcircled{1}
 \end{aligned}$$

$$g(y) = \frac{3}{x+2} \dots \textcircled{2}$$

Gantikan ① ke dalam ②,
Substitute ① into ②,

$$g(y) = \frac{3}{\frac{y-1}{3} + 2} \times \frac{3}{3}$$

$$\begin{aligned}
 &= \frac{9}{y-1+6} \\
 &= \frac{9}{y+5}
 \end{aligned}$$

$$\therefore g(x) = \frac{9}{x+5}, x \neq -5$$

13 Hubungan banyak dengan satu

Many-to-one relation

Tiada songsangan

No inverse

$$\text{14 (a) } f(x) = 6x - 5$$

$$\begin{aligned}
 \text{Biar/Let } f^{-1}(7) &= y, \\
 f(y) &= 7 \\
 6y - 5 &= 7 \\
 6y &= 12
 \end{aligned}$$

$$\begin{aligned}
 y &= 2 \\
 f^{-1}(7) &= 2
 \end{aligned}$$

$$\text{(b) Biar/Let } f^{-1}(x) = y,$$

$$\begin{aligned}
 f(y) &= x \\
 6y - 5 &= x
 \end{aligned}$$

$$6y = x + 5$$

$$y = \frac{x+5}{6}$$

$$f^{-1}(x) = \frac{x+5}{6}$$

$$\text{15 (a) } h^{-1}(x) = y$$

$$h(y) = x$$

$$\frac{4y}{5-3y} = x$$

$$4y = 5x - 3xy$$

$$3xy + 4y = 5x$$

$$y(3x + 4) = 5x$$

$$y = \frac{5x}{3x+4}$$

$$h^{-1}(x) = \frac{5x}{3x+4}, x \neq -\frac{4}{3}$$

$$\text{(b) } h^{-1}(m) = h(1)$$

$$h^{-1}(m) = \frac{4(1)}{5-3(1)}$$

$$h^{-1}(m) = 2$$

$$h(2) = m$$

$$\frac{4(2)}{5-3(2)} = m$$

$$m = -8$$

$$\text{16 (a) } p = -2$$

$$\text{(b) } f^{-1}(x) = y$$

$$f(y) = x$$

$$9 - (y+2)^2 = x$$

$$(y+2)^2 = 9 - x$$

$$y+2 = \sqrt{9-x}$$

$$y = \sqrt{9-x} - 2$$

$$f^{-1}(x) = \sqrt{9-x} - 2$$

$$\text{17 (a) } f(3) = 3^2 - 4$$

$$= 5$$

$$\text{Biar/Let } g^{-1}(5) = y,$$

$$g(y) = 5$$

$$\begin{aligned}\frac{y}{2y-3} &= 5 \\ y &= 10y - 15 \\ 9y &= 15 \\ y &= \frac{5}{3} \\ g^{-1}f(3) &= \frac{5}{3}\end{aligned}$$

18 $g(x) = \frac{1}{2}x - 3, h(x) = 7 - 4x$

Biar/Let $g^{-1}(x) = y,$

$g(y) = x$

$\frac{1}{2}y - 3 = x$

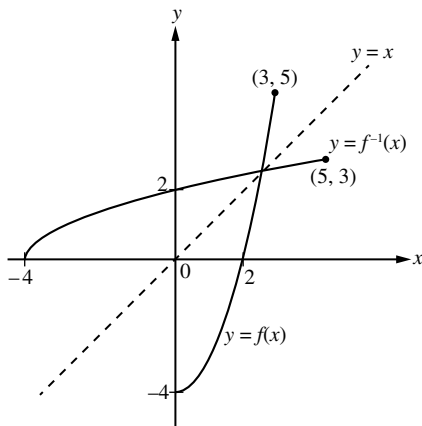
$\frac{1}{2}y = x + 3$

$y = 2x + 6$

$g^{-1}(x) = 2x + 6$

$hg^{-1}(x) = h(2x + 6)$
 $= 7 - 4(2x + 6)$
 $= -8x - 17$

19 (a)



(b) Domain bagi/Domain of $f^{-1}(x)$: $-4 \leq x \leq 5$

Julat bagi/Range of $f^{-1}(x)$: $0 \leq f^{-1}(x) \leq 3$

Praktis Sumatif

Kertas 1

1 (a) B dan/and D

Setiap objek (nilai x) mempunyai hanya satu imej (nilai y).

Every object (x -value) has only one image (y -value).

(b) D

Hubungan satu kepada satu/One to one relation

2 (a) Gantikan/Substitute ($p, 0$),

$0 = |4p - 7|$

$4p - 7 = 0$

$p = \frac{7}{4}$

Gantikan/Substitute ($0, q$),

$q = |4(0) - 7|$
 $= 7$

(b) $|4x - 7| = 7$

$4x - 7 = -7$

$4x = 0$

$x = 0$

$4x - 7 = 7$

$4x = 14$

$x = \frac{7}{2}$

Domain: $0 \leq x \leq \frac{7}{2}$

3 (a) (i) $h(x) = 6(x - 12) + 150$

$= 6x - 72 + 150$

$= 6x + 78$

(ii) $6x + 78 = 180$

$6x = 102$

$x = 17$

(b) Julat bagi/Range of $g(x)$: $-5 \leq g(x) \leq 11$

Domain bagi/Domain of $g^{-1}(x)$: $-5 \leq x \leq 11$

4 (a) $gh(2) = 1$

$g(2^2 + q) = 1$

$p(4 + q) - 5 = 1$

$p(4 + q) = 6$

$4 + q = \frac{6}{p}$

$q = \frac{6}{p} - 4$

(b) $f(x) = (\sqrt{x} + 1)^2$

$f^2(x) = ff(x)$

$= f((\sqrt{x} + 1)^2)$

$= (\sqrt{(\sqrt{x} + 1)^2} + 1)^2$

$= (\sqrt{x} + 1 + 1)^2$

$= (\sqrt{x} + 2)^2$

$f^3(x) = ff^2(x)$

$= f((\sqrt{x} + 2)^2)$

$= (\sqrt{(\sqrt{x} + 2)^2} + 1)^2$

$= (\sqrt{x} + 2 + 1)^2$

$= (\sqrt{x} + 3)^2$

$f^n(x) = (\sqrt{x} + n)^2$

5 (a) $x + 7 \geq 0$

$x \geq -7$

$a = -7$

(b) $fh(x) = x$

$h(x) = f^{-1}(x)$

Let $f^{-1}(x) = y$

$f(y) = x$

$\frac{\sqrt{y+7}}{2} = x$

$\sqrt{y+7} = 2x$

$y + 7 = 4x^2$

$y = 4x^2 - 7$

$h(x) = 4x^2 - 7$

(c) $ff^{-1}(x + 2) = g(x)$

$x + 2 = \frac{1}{3}x^2 - 4$

$3x + 6 = x^2 - 12$

$x^2 - 3x - 18 = 0$

$$(x + 3)(x - 6) = 0$$

$$x = -3, x = 6$$

$$6 \text{ (a) (i) } g^{-1}(x) = y$$

$$g(y) = x$$

$$2y + 3 = x$$

$$y = \frac{x-3}{2}$$

$$g^{-1}(x) = \frac{x-3}{2}$$

$$\text{(ii) } fg(x) = 8x^2 - 5$$

$$\text{Biar/Let } g(x) = y$$

$$2x + 3 = y$$

$$x = \frac{y-3}{2}$$

$$f(y) = 8\left(\frac{y-3}{2}\right)^2 - 5$$

$$= 8\left(\frac{y^2 - 6y + 9}{4}\right) - 5$$

$$= 2y^2 - 12y + 18 - 5$$

$$= 2y^2 - 12y + 13$$

$$\therefore f(x) = 2x^2 - 12x + 13$$

Kaedah alternatif/Alternative method:

$$fg[g^{-1}(x)] = 6g^{-1}(x) - 5$$

$$f(x) = 8\left(\frac{x-3}{2}\right)^2 - 5$$

$$= 8\left(\frac{x^2 - 6x + 9}{4}\right) - 5$$

$$= 2x^2 - 12x + 18 - 5$$

$$= 2x^2 - 12x + 13$$

(b) $f(x)$ ialah suatu fungsi kuadratik. Ia mempunyai hubungan banyak kepada satu (bukan satu kepada satu). Maka, ia tidak mempunyai songsangan.

$f(x)$ is a quadratic function. It has many-to-one relation (not one-to-one relation). Therefore, it has no inverse.

Kertas 2

$$1 \text{ (a) } f(x) = \frac{x+b}{3x-2}, x \neq a$$

$$3x - 2 = 0$$

$$x = \frac{2}{3}$$

$$\therefore a = \frac{2}{3}$$

$$\text{(b) (i) } f(-1) = -1$$

$$\frac{-1+b}{3(-1)-2} = -1$$

$$\frac{-1+b}{-5} = -1$$

$$-1 + b = 5$$

$$b = 6$$

$$\text{(ii) } f(x) = x$$

$$\frac{x+6}{3x-2} = x$$

$$x + 6 = 3x^2 - 2x$$

$$3x^2 - 3x - 6 = 0$$

$$x^2 - x - 2 = 0$$

$$(x+1)(x-2) = 0$$

$$x \neq -1 \therefore x = 2$$

$$2 \text{ } f(x) = 3x + 1, g(x) = 2x^2 - 5x$$

$$\text{(a) } fg(2) = g[2(2)^2 - 5(2)]$$

$$= g(-2)$$

$$= 3(-2) + 1$$

$$= -5$$

$$\text{(b) } gf(x) = g(3x + 1)$$

$$= 2(3x + 1)^2 - 5(3x + 1)$$

$$= 2(9x^2 + 6x + 1) - 15x - 5$$

$$= 18x^2 + 12x + 2 - 15x - 5$$

$$= 18x^2 - 3x - 3$$

$$18x^2 - 3x - 3 = 12$$

$$18x^2 - 3x - 15 = 0$$

$$\div 3, 6x^2 - x - 5 = 0$$

$$(6x + 5)(x - 1) = 0$$

$$x = -\frac{5}{6}, x = 1$$

$$3 \text{ } h : x \rightarrow \frac{p}{x+q}, x \neq -q, h^{-1} : x \rightarrow \frac{5-4x}{x}, x \neq 0$$

$$\text{(a) } h^{-1}(x) = y$$

$$h(y) = x$$

$$\frac{p}{y+q} = x$$

$$p = xy + qx$$

$$xy = p - qx$$

$$y = \frac{p - qx}{x}$$

$$h^{-1}(x) = \frac{p - qx}{x}$$

$$\frac{5 - 4x}{x} = \frac{p - qx}{x}$$

Bandingkan pemalar/Compare constant: $p = 5$

Bandingkan pekali x /Compare coefficient of x : $q = 4$

$$\text{(b) } h^{-1}(x) = \frac{5 - 4x}{x}$$

$$(h^{-1})^2(x) = h^{-1}h^{-1}(x)$$

$$= h^{-1}\left(\frac{5 - 4x}{x}\right)$$

$$= \frac{5 - 4\left(\frac{5 - 4x}{x}\right)}{\frac{5 - 4x}{x}}$$

$$= \frac{5x - 20 + 16x}{5 - 4x}$$

$$= \frac{21x - 20}{5 - 4x}, x \neq \frac{5}{4}$$

$$4 \text{ (a) } f(y) = 2x + n, g(y) = \frac{m}{1 + ny}$$

$$f(2) = 1$$

$$2(2) + n = 1$$

$$n = -3$$

$$g(1) = -2$$

$$\frac{m}{1 + n(1)} = -2$$

$$m = -2 - 2n$$

$$m = -2 - 2(-3)$$

$$m = 4$$

$$\text{(b) } f(x) = 2x - 3, g(y) = \frac{4}{1 - 3y}$$

$$gf(x) = g(2x - 3)$$

$$= \frac{4}{1 - 3(2x - 3)}$$

$$= \frac{4}{1-6x+9}$$

$$= \frac{4}{10-6x}$$

$$= \frac{2}{5-3x}, x \neq \frac{5}{3}$$

(c) $(gf)^{-1}(x) = y$
 $(gf)(y) = x$
 $\frac{2}{5-3y} = x$
 $3xy = 5x - 2$
 $y = \frac{5x-2}{3x}$
 $\therefore gf^{-1}(x) = \frac{5x-2}{3x}, x \neq 0$

5 (a) (i) $f^{-1}(x) = \frac{4-x}{k}, g(x) = 3x^2 + p$

Biar/Let $f(x) = y,$
 $f^{-1}(y) = x$
 $\frac{4-y}{k} = x$
 $4-y = kx$
 $y = 4-kx$
 $f(x) = 4-kx$

(ii) $f(x^2) = 2g(x)$
 $4-kx^2 = 2(3x^2+p)$
 $-kx^2 + 4 = 6x^2 + 2p$

Bandingkan pekali x /Compare coefficient of x :

$$-k = 6$$

$$k = -6$$

Bandingkan pemalar/Compare constant:

$$4 = 2p$$

$$p = 2$$

(b) $f(x) = 4 + 6x$
 $y = |f(x)|$
 $y = |4 + 6x|$

Pada paksi- x /At x -axis, $y = 0,$

$$4 + 6x = 0$$

$$x = -\frac{2}{3}$$

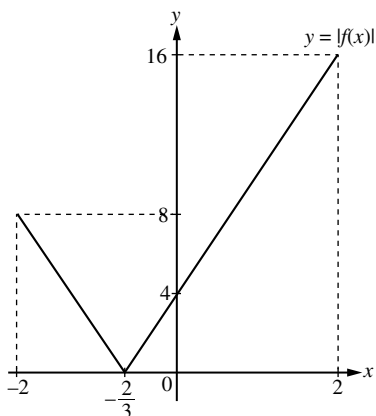
Pada paksi- y /At y -axis, $x = 0, y = 4$

$$x = -2, y = |4 + 6(-2)|$$

$$= 8$$

$$x = 2, y = |4 + 6(2)|$$

$$= 16$$



Julat/Range: $0 \leq y \leq 16$

6 (a) (i) $f(x) = px - q$
 Biar/Let $f^{-1}(x) = y,$
 $f(y) = x$
 $py - q = x$
 $y = \frac{x+q}{p}$
 $\therefore f^{-1}(x) = \frac{x+q}{p}$

(ii) $f^{-1}(-1) = 2$
 $\frac{-1+q}{p} = 2$
 $q = 2p + 1 \dots \textcircled{1}$
 $f(4) = 5$

$$4p - q = 5 \dots \textcircled{2}$$

Gantikan $\textcircled{1}$ ke dalam $\textcircled{2}$ /Substitute $\textcircled{1}$ into $\textcircled{2},$

$$4p - (2p + 1) = 5$$

$$2p - 1 = 5$$

$$2p = 6$$

$$p = 3$$

Gantikan ke dalam $\textcircled{1}$ /Substitute into $\textcircled{1},$

$$q = 2(3) + 1$$

$$= 7$$

(b) (i) $g(x) = 1 - 3x$

Biar/Let $g^{-1}(x) = y,$
 $g(y) = x$
 $1 - 3y = x$
 $3y = 1 - x$
 $y = \frac{1-x}{3}$
 $\therefore g^{-1}(x) = \frac{1-x}{3}$

(ii) $hg(x) = 9x^2 - 6x - 4$

$$hg[g^{-1}(x)] = 9\left(\frac{1-x}{3}\right)^2 - 6\left(\frac{1-x}{3}\right) - 4$$

$$h(x) = 9\left(\frac{1-2x+x^2}{9}\right) - 2(1-x) - 4$$

$$= 1 - 2x + x^2 - 2 + 2x - 4$$

$$\therefore h(x) = x^2 - 5$$

7 (a) (i) $g^2(x) = gg(x)$

$$= g\left(\frac{1+x}{1-x}\right)$$

$$= \frac{1 + \frac{1+x}{1-x}}{1 - \frac{1+x}{1-x}}$$

$$= \frac{1-x + 1+x}{1-x-1-x}$$

$$= \frac{2}{-2x}$$

$$= -\frac{1}{x}, x \neq 0$$

(ii) $g^3(x) = g^2g(x)$

$$= g^2\left(\frac{1+x}{1-x}\right)$$

$$= -\frac{1}{\frac{1+x}{1-x}}$$

$$= -\left(\frac{1-x}{1+x}\right)$$

$$= \frac{x-1}{x+1}, x \neq -1$$

$$(iii) g^4(x) = g^2 g^2(x)$$

$$= g^2\left(\frac{1}{x}\right)$$

$$= -\frac{1}{\left(\frac{1}{x}\right)}$$

$$= x$$

$$(b) (i) g^{15}(x) = g^3 g^4 g^4 g^4(x)$$

$$= g^3(x)$$

$$= \frac{x-1}{x+1}, x \neq -1$$

$$(ii) g^{4n-3}(x) = g^{4n-4+1}(x)$$

$$= g^{4(n-1)} g(x)$$

$$= g(x)$$

$$= \frac{1+x}{1-x}, x \neq 1$$

8 (a) Biar/Let $g^{-1}(x) = y$,

$$g(y) = x$$

$$\frac{6-3y}{2} = x$$

$$6-3y = 2x$$

$$3y = 6-2x$$

$$y = \frac{6-2x}{3}$$

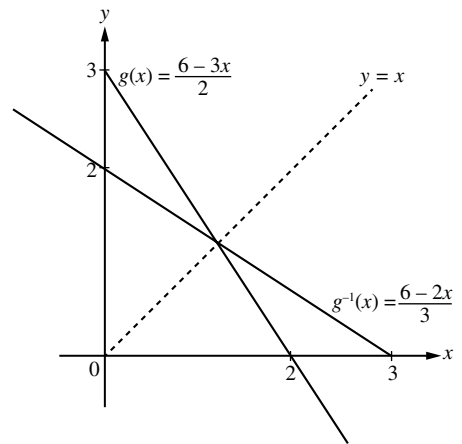
$$g^{-1}(x) = \frac{6-2x}{3} \text{ atau/or } g^{-1}(x) = 2 - \frac{2}{3}x$$

(b) Bagi/For $y = \frac{6-3x}{2}$,

$$x=0, y = \frac{6-0}{2} = 3$$

$$y=0, 6-3x=0$$

$$x=2$$



(c) Bagi/For $g(x)$:

Domain: $x \geq 0$, Julat/Range: $g(x) \leq 3$

Bagi/For $g^{-1}(x)$:

Domain: $x \leq 3$, Julat/Range: $g^{-1}(x) \geq 0$

(d) $g(x) = g^{-1}(x)$

$$\frac{6-3x}{2} = \frac{6-2x}{3}$$

$$18-9x = 12-4x$$

$$5x = 6$$

$$x = \frac{6}{5}$$