

Functions

Ex A

$$\textcircled{2} \quad f(x) = 3x^2, \quad g(x) = \frac{6}{x}$$

$$\text{(i)} \quad f(2) = 3 \times 2^2 \\ = \underline{\underline{12}}$$

$$\text{(ii)} \quad f(-5) = 3 \times (-5)^2 \\ = \underline{\underline{75}}$$

$$\text{(iii)} \quad g(2) = \frac{6}{2} \\ = \underline{\underline{3}}$$

$$\text{(iv)} \quad g(-1.5) = \frac{6}{-1.5} \\ = \underline{\underline{-4}}$$

$$\text{(v)} \quad g\left(\frac{1}{2}\right) = \frac{6}{\frac{1}{2}} \\ = 6 \times \frac{2}{1} \\ = \underline{\underline{12}}$$

$$\text{(vi)} \quad g\left(-\frac{2}{3}\right) = \frac{6}{-\frac{2}{3}} \\ = 6 \times \frac{3}{-2} \\ = \underline{\underline{-9}}$$

$$\textcircled{3} \quad f(x) = 8 - 3x, \quad g(x) = 4(x + 3)$$

$$\text{(i)} \quad f(x) = 0 \\ 8 - 3x = 0 \\ 8 = 3x \\ x = \underline{\underline{\frac{8}{3}}}$$

$$\text{(ii)} \quad g(x) = 20 \\ 4(x + 3) = 20 \\ x + 3 = 5 \\ x = \underline{\underline{2}}$$

$$\text{(iii)} \quad f(x) = g(x) \\ 8 - 3x = 4(x + 3) \\ 8 - 3x = 4x + 12 \\ -4 = 7x \\ x = \underline{\underline{-\frac{4}{7}}}$$

$$\textcircled{4} \quad h(x) = 3x - 2$$

$$\begin{aligned} \text{(i)} \quad h(2x) &= 3 \times 2x - 2 \\ &= \underline{\underline{6x - 2}} \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad h(x+1) &= 3(x+1) - 2 \\ &= 3x + 3 - 2 \\ &= \underline{\underline{3x + 1}} \end{aligned}$$

$$\text{(iii)} \quad h(x^2) = \underline{\underline{3x^2 - 2}}$$

$$\textcircled{5} \quad f(x) = x^2 + 5x - 1$$

$$\begin{aligned} \text{(i)} \quad f(3x) &= (3x)^2 + 5 \times 3x - 1 \\ &= \underline{\underline{9x^2 + 15x - 1}} \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad f(x-2) &= (x-2)^2 + 5(x-2) - 1 \\ &= (x-2)(x-2) + 5x - 10 - 1 \\ &= x^2 - 2x - 2x + 4 + 5x - 10 - 1 \\ &= \underline{\underline{x^2 + x - 7}} \end{aligned}$$

$$\textcircled{6} \quad g(x) = \frac{x+6}{2x}$$

$$\begin{aligned} \text{(i)} \quad g(3) &= \frac{3+6}{2 \times 3} \\ &= \frac{9}{6} \\ &= \underline{\underline{\frac{3}{2}}} \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad g(x) &= 3 \\ \frac{x+6}{2x} &= 3 \end{aligned}$$

$$x+6 = 6x$$

$$6 = 5x$$

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

$$(iii) \quad g(2x) = 1$$

$$\frac{2x+6}{2 \times 2x} = 1$$

$$\frac{2x+6}{4x} = 1$$

$$2x+6 = 4x$$

$$6 = 2x$$

$$x = \underline{\underline{3}}$$

F x B

①

$$(i) \quad f(x) = 3x, \quad x < 2$$

$$\text{Range: } \underline{\underline{f(x) < 6}}$$

$$(ii) \quad f(x) = x+4, \quad x \geq 1$$

$$\text{Range: } \underline{\underline{f(x) \geq 5}}$$

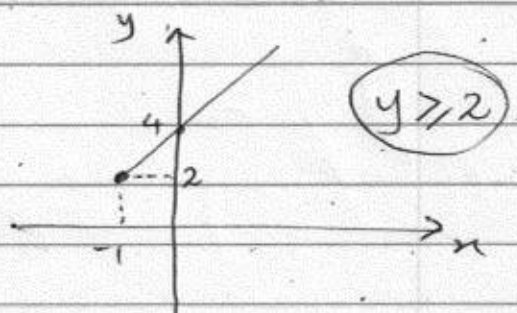
$$(iii) \quad f(x) = 2x+4, \quad x \geq -1$$

$$\text{Range: } \underline{\underline{f(x) \geq 2}}$$

$$y = 2x+4$$

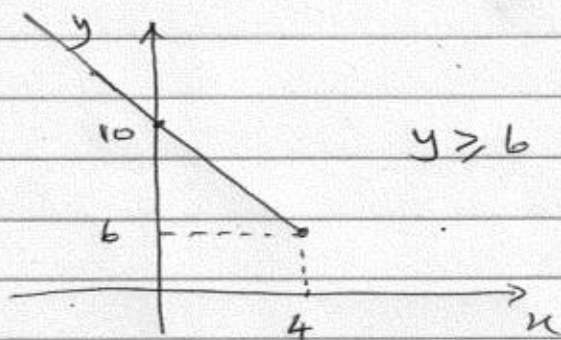
when $x = -1$,

$$y = 2(-1)+4 = 2$$



(iv) $f(x) = 10 - x, x \leq 4$

$y = 10 - x$
when $x = 4, y = 10 - 4 = 6$



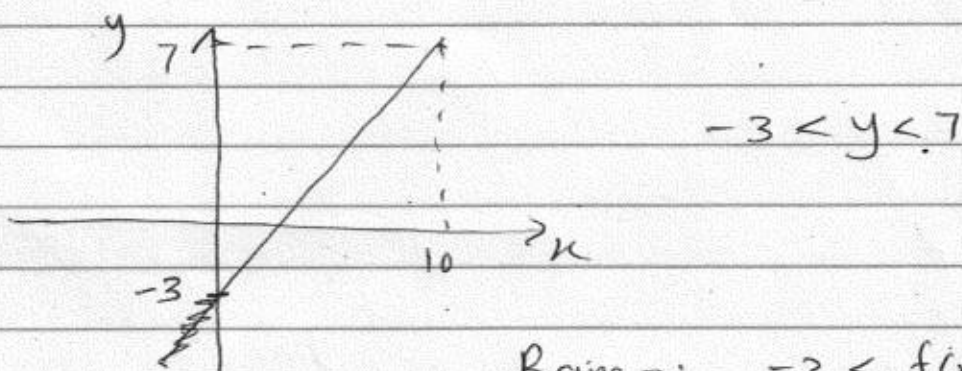
Range: $f(x) \geq 6$

(v) $f(x) = 2x, 1 \leq x \leq 5$

Range: $2 \leq f(x) \leq 10$

(vi) $f(x) = x - 3, 0 < x < 10$

$y = x - 3$
when $x = 0, y = 0 - 3 = -3$
when $x = 10, y = 10 - 3 = 7$

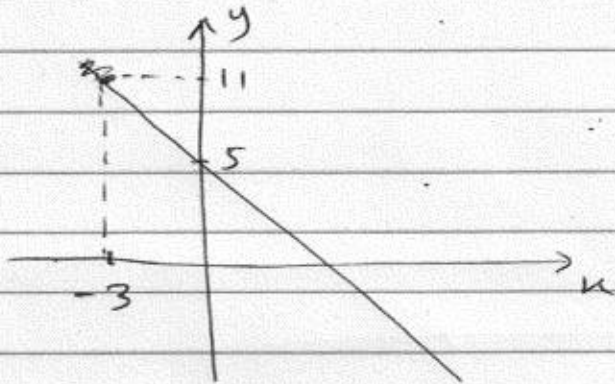


Range: $-3 < f(x) < 7$

(vii) $f(x) = 5 - 2x$, $x \geq -3$

$$y = 5 - 2x$$

when $x = -3$, $y = 5 - 2(-3)$
 $= 11$



$$y \leq 11$$

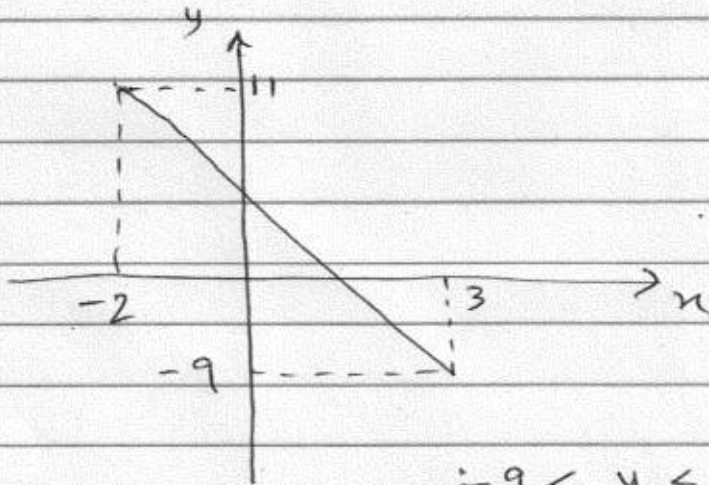
Range: $f(x) \leq 11$

(viii) $f(x) = 3 - 4x$, $-2 \leq x \leq 3$

$$y = 3 - 4x$$

when $x = -2$, $y = 3 - 4(-2) = 11$

when $x = 3$, $y = 3 - 4(3) = -9$



$$-9 \leq y \leq 11$$

\therefore Range: $-9 \leq f(x) \leq 11$

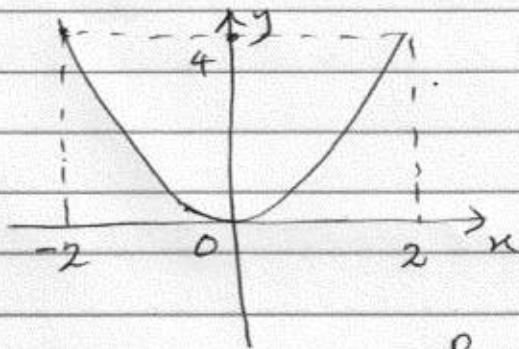
②

1i) $f(x) = x^2, -2 \leq x \leq 2$

$$y = x^2$$

when $x = -2, y = (-2)^2 = 4$

when $x = 2, y = 2^2 = 4$



$$0 \leq y \leq 4$$

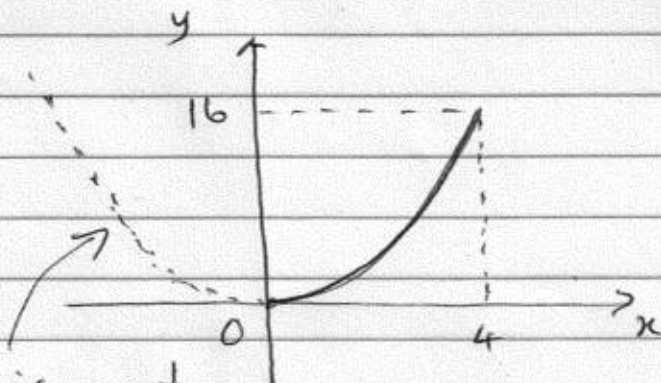
Range: $0 \leq f(x) \leq 4$

(ii) $f(x) = x^2, 0 < x < 4$

$$y = x^2$$

when $x = 0, y = 0$

when $x = 4, y = 16$



This part
doesn't exist
in this function
as $0 < x < 4$.

$$0 < y < 16$$

∴ Range: $0 < f(x) < 16$

(iii) $f(x) = x^3, x \geq 0$

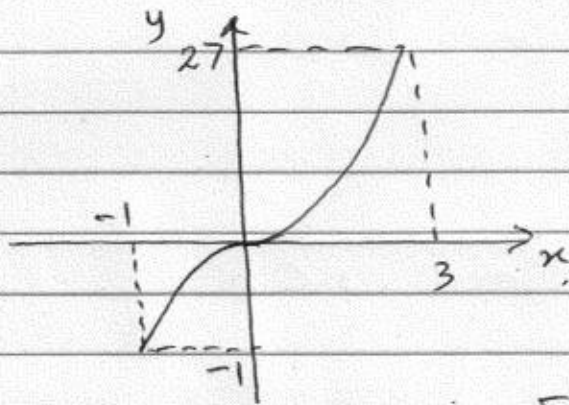
Range: $f(x) \geq 0$

(iv) $f(x) = x^3, -1 \leq x \leq 3$

$y = x^3$

When $x = -1, y = (-1)^3 = -1$

When $x = 3, y = 3^3 = 27$



$-1 \leq y \leq 27$

Range: $-1 \leq f(x) \leq 27$

~~3~~

3

(i) Domain: $1 \leq x \leq 5$

Range: $3 \leq f(x) \leq 8$

(ii) Domain: $-4 \leq x \leq 4$, Range: $0 \leq f(x) \leq 2$

(iii) Domain: $-2 \leq x \leq 3$, Range: $0 \leq f(x) \leq 2$

-7- Because y values on the graph are between 0 and 2.