Jurong Junior Pioneer College
H2 Mathematics **JC1 2026**
WA 2 (Solution)

1 (a)

$$\frac{x+9}{8+2x-x^2}<1$$

$$\frac{x+9}{8+2x-x^2}-1<0$$

Note: Do not cross multiply.

$$\frac{x+9}{8+2x-x^2}-\frac{8+2x-x^2}{8+2x-x^2}<0$$

$$\frac{x^2-x+1}{8+2x-x^2}<0$$

$$\frac{x^2-x+1}{x^2-2x-8}>0$$

$$\frac{x^2-x+1}{(x+2)(x-4)}>0$$

Alternatively,

$$\frac{x^2-x+1}{8+2x-x^2}<0$$

$$\frac{x^2-x+1}{(4-x)(2+x)}<0$$

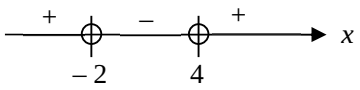
Note: Take note of coefficient of x^2 and factorise correctly.

Consider $x^2-x+1=\left(x-\frac{1}{2}\right)^2+\frac{3}{4}$

Since $\left(x-\frac{1}{2}\right)^2\geq 0$, $\left(x-\frac{1}{2}\right)^2+\frac{3}{4}>0$ for all real values of x.

(**OR** coefficient of $x^2=1>0$ and discriminant, $b^2-4ac=(-1)^2-4(1)(1)=-3<0$ imply that $x^2-x+1>0$ for all real values of x.)

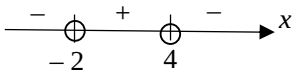
Therefore, we consider $(x+2)(x-4)>0$



$\therefore x<-2$ or $x>4$

Alternatively,

$(4-x)(2+x)<0$



$\therefore x<-2$ or $x>4$

(b)

$$\frac{x^2-9}{x^4+2x^2-8}<1$$

$$\frac{-x^2+9}{-x^4-2x^2+8}<1$$

$$\frac{-x^2+9}{8+2(-x^2)-(-x^2)^2}<1$$

By replacing x with $-x^2$, we have:

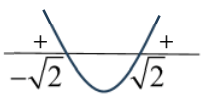
Using the **(b)** answer, $-x^2<-2$ or $-x^2>4$ (No solution since $-x^2\leq 0$ for all real x)

$$x^2>2$$

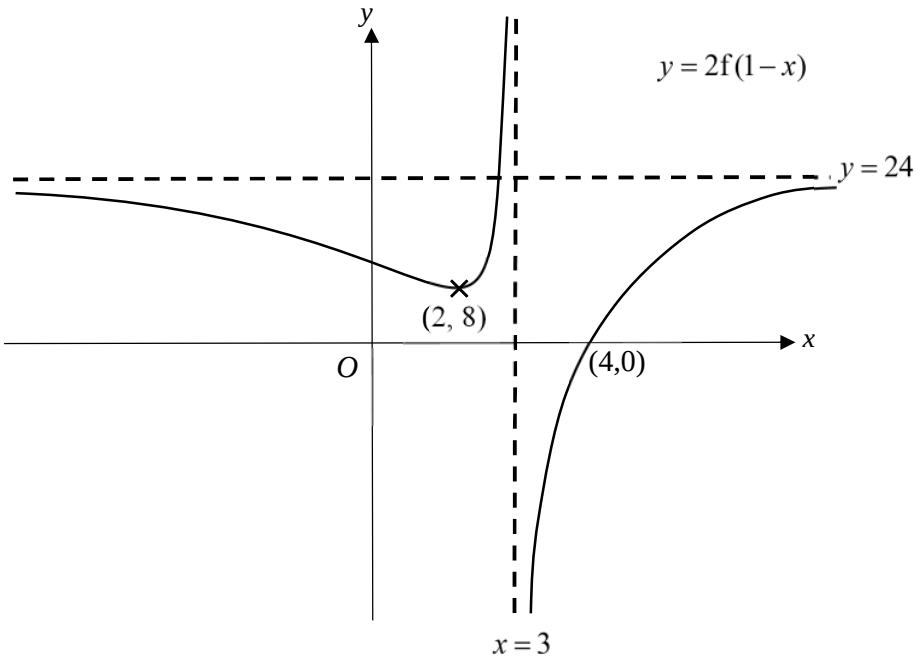
$$x^2-2>0$$

$$\left(x+\sqrt{2}\right)\left(x-\sqrt{2}\right)>0$$

$$x<-\sqrt{2} \text{ or } x>\sqrt{2}$$

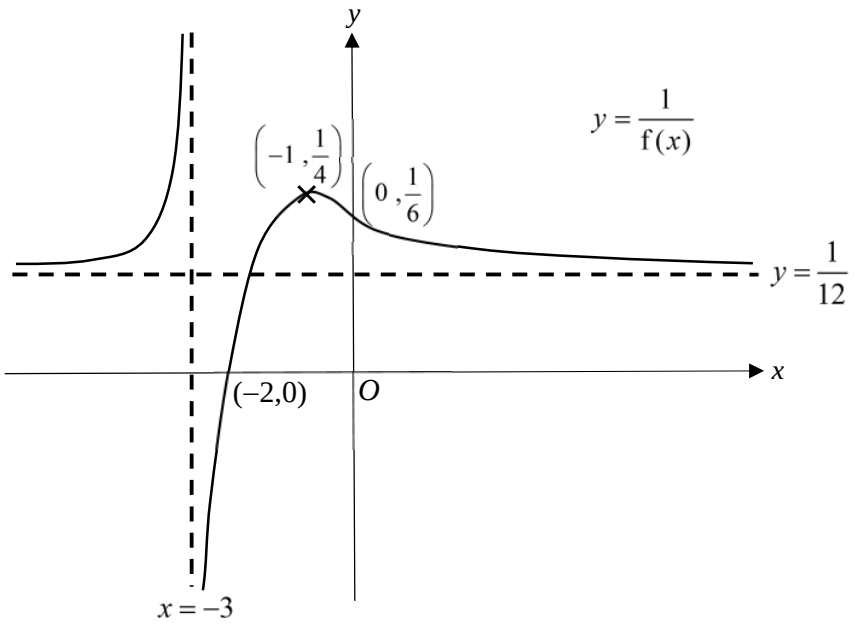


2 (a)



Note: (0,6) is transformed to (1,12) which is not required in this answer.

(b)



3 (a) $\left(\frac{1}{2}a, b\right)$

(b) $(-a, b)$, (a, b)

(c) $(a, -b)$

4

(a) Least value of $k = 0$.

(b) Let $y = \dfrac{1}{x^2 - 4}$, $x > 2$.

$x^2 y - 4y = 1$

$x^2 = \dfrac{1}{y} + 4$

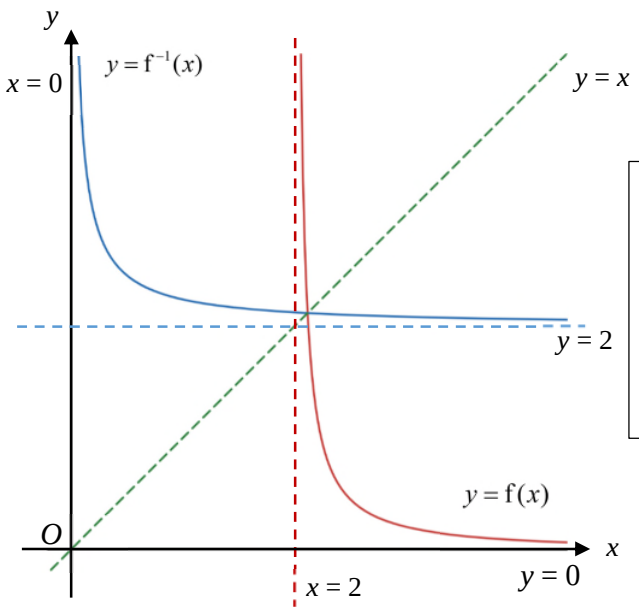
$x = \pm\sqrt{\dfrac{1}{y} + 4}$

Since $x > 2$, $x = \sqrt{\dfrac{1}{y} + 4}$

Therefore, $\mathrm{f}^{-1}(x) = \sqrt{\dfrac{1}{x} + 4}$, $x \in \mathbb{R}$, $x > 0$

$\mathrm{D}_{\mathrm{f}^{-1}} = (0, \infty)$

(c)



Note:

1. 2 graphs must be symmetrical about the line $y = x$
2. Line $y = x$ must be drawn.

Relationship: Graphs of f and f^{-1} are reflections of each other about the line $y = x$.

Note: "symmetrical" is a property of the 2 graphs and not a relationship.

(d) Given $\mathrm{f}(x) = \mathrm{f}^{-1}(x)$

Consider $\mathrm{f}(x) = x$

$\dfrac{1}{x^2 - 4} = x$

$x^3 - 4x - 1 = 0$, where $a = 1, b = -4, c = -1$