

Grade 12 Unit Review: Transformations

1. Draw the following relations on GeoGebra. Classify them as (i) one-to-one; (ii) many-to-one; (iii) one-to-many or (iv) many-to-many.

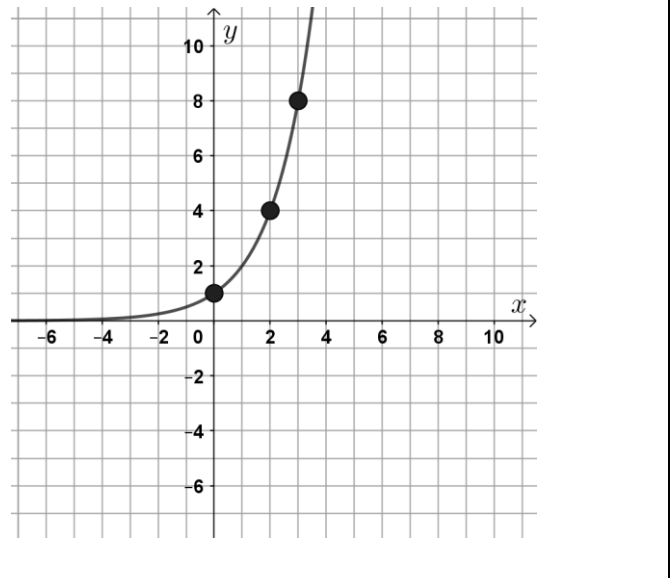
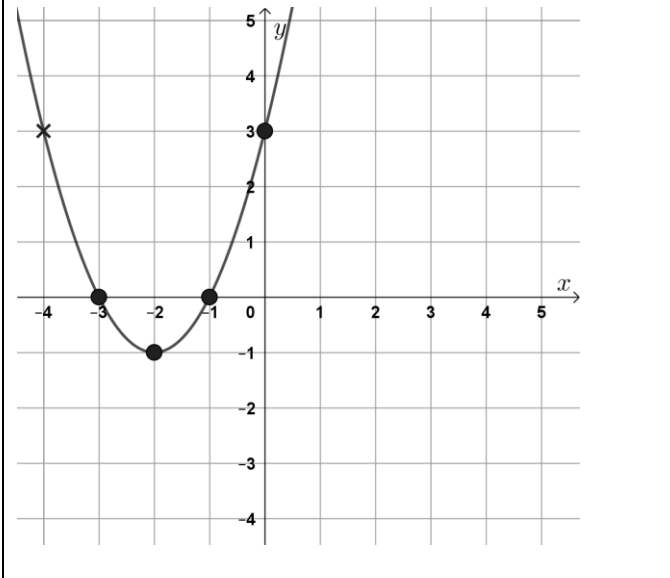
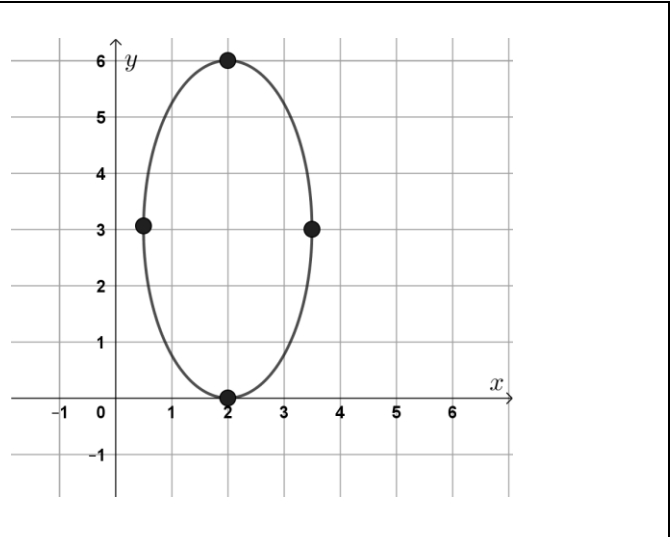
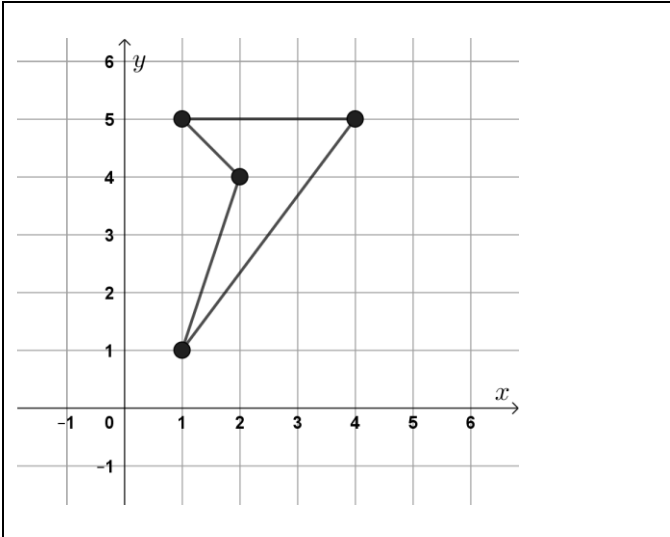
$$y = x^2 + 5$$

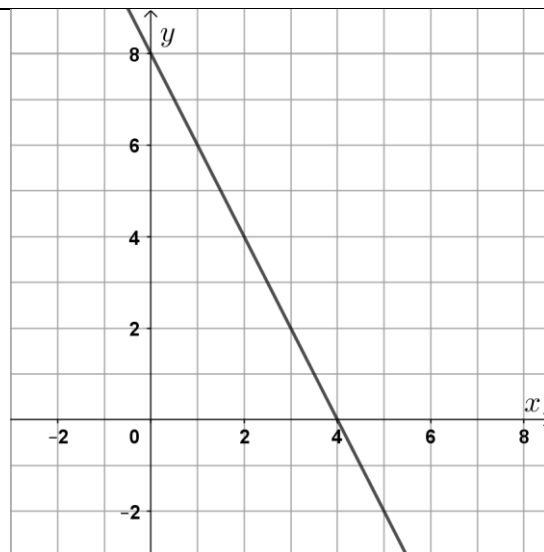
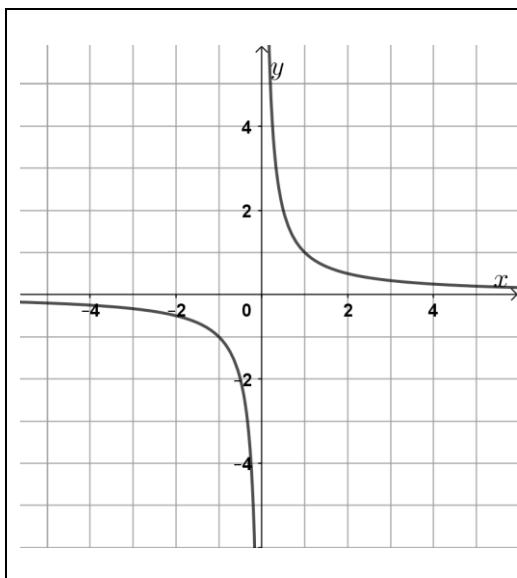
$$x^2 + y^2 = 9$$

$$y = 2^x - 16$$

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

2. An (x, y) relation is drawn on each axis. Draw the inverse relation for each.





3. (a) What is meant by the property 'self-inverse'?
- (b) Give an example of a function that is self-inverse.
4. For each of the following functions of x :
- (a) draw the graph $y = f(x)$ on graph paper for the stated domain only, by plotting key features (x, y – intercepts etc) (not using graphing technology) (separate axes for each graph)
- (b) State the domain and range for the function $f(x)$
- (c) draw the associated graph $y = f^{-1}(x)$
- (d) Calculate $f^{-1}(x)$. State the domain and range for $f^{-1}(x)$

$f(x) = 3x - 12$	$f(x) = (x - 4)^2 + 6, \quad x \geq 4$
$f(x) = x^2 + 6x - 16, \quad x \leq -3,$	$f(x) = \frac{1}{x - 3} + 4$

- 5 Consider the graph $y = f(x)$.

Describe fully the following transformations:

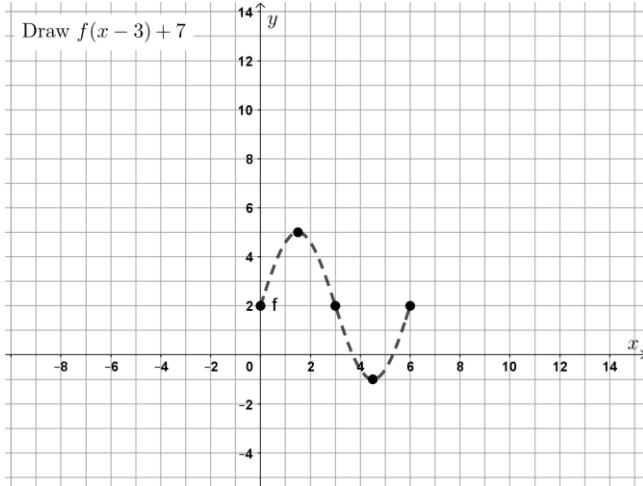
(a) $f(x) + 5$	(e) $-f(x)$
(b) $3f(x - 4)$	(f) $f^{-1}(x)$
(c) $f(-x)$	(g) $2f(3x)$

(d) $f(x - 5) + 7$

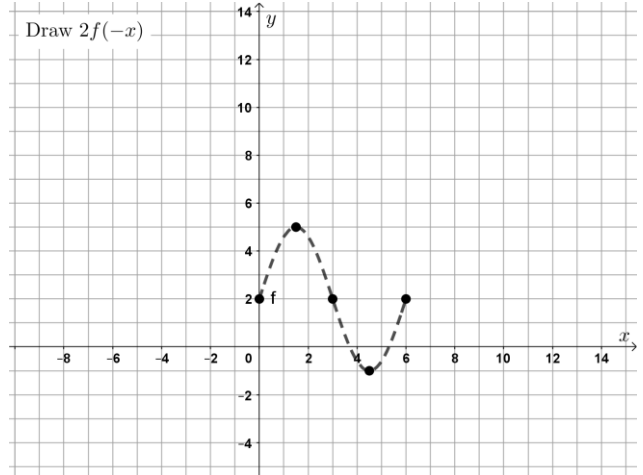
(h) $2f(3(x - 4)) - 5$

6 The graph $y = f(x)$ is drawn on the axes below. Draw the image of the function under the transformations indicated:

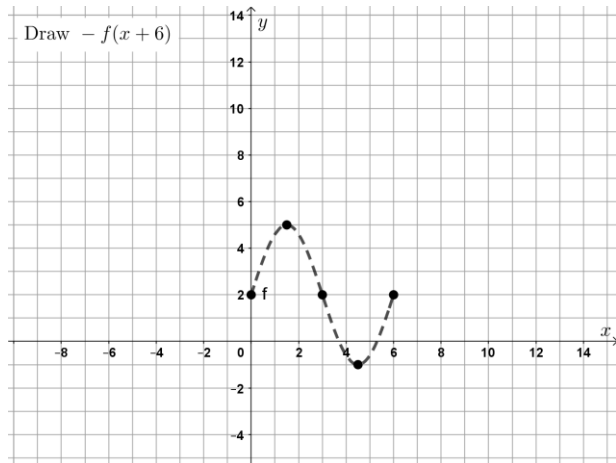
Draw $f(x - 3) + 7$



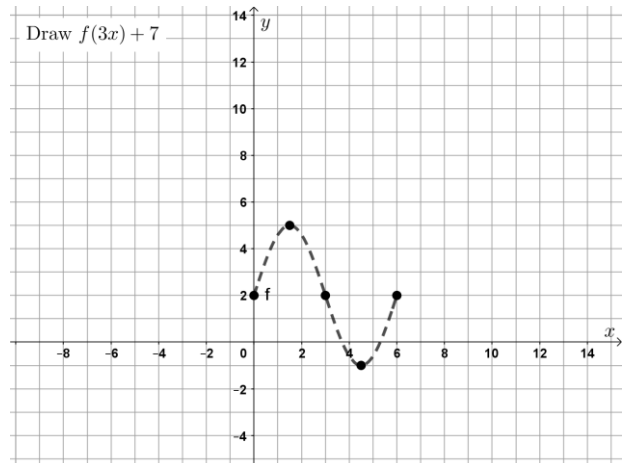
Draw $2f(-x)$



Draw $-f(x + 6)$



Draw $f(3x) + 7$



7 Let $f(x) = x^2 + 6x - 8$

Calculate $g(x)$, and write in the form $ax^2 + bx + c$ when

(a) $g(x) = f(2x)$	(c) $g(x) = f(x - 5) + 6$
(b) $g(x) = f(x - 5)$	(d) $g(x) = -f(x)$
(e) $g(x) = f(-x)$	(f) $g(x) = 2f(3(x + 1)) - 5$

8 The point $A(3,5)$ lies on the graph of the function $y = f(x)$. What are the coordinates of A' , the image of A , under the transformation

(a) $f(x - 5) + 3$	(b) $f(3x)$
(c) $f^{-1}(x)$	(d) $2f(3(x + 1)) - 5$