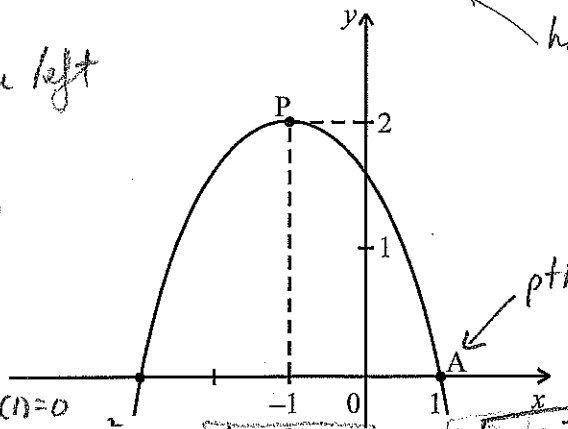
Solutions

SL Mathematics Year 1 Sem1_Final_Review2019.docx

Semester 1 Review – Part 5: Transformations. You may use calculators on these problems

1. The diagram shows part of the graph of $g(x) = a(x-h)^2 + k$. The graph has its vertex at P, and passes through the point A with coordinates (1, 0). Think of this as a transformation of the function $f(x) = x^2$

has vertex at (0,0)



pt A = (1,0)

(a) Write down the value of

(i) h; → Horizontal Translation 1 to the left

$h = -1$

(ii) k. Vertical Translation 2 up

$k = 2$

(b) Calculate the value of a.

$a < 0$ ∵ have Reflection

$g(x) = a(x-(-1))^2 + 2$

$= a(x+1)^2 + 2$

using point A, $g(1) = 0$

$g(1) = a(1+1)^2 + 2 = a(2)^2 + 2 = 4a + 2 = 0$ → $a = -\frac{1}{2}$

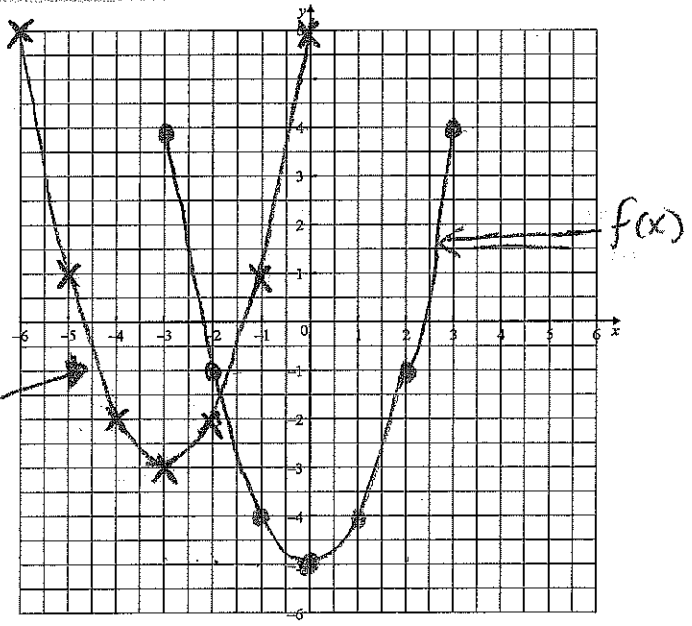
2. Let $f(x) = x^2 - 5$.

(a) On the grid below draw the graph of $f(x)$ for $-3 \le x \le 3$. Vert = (0, −5) plot 5 more pts

(b) Let $g(x) = f(x+3) + 2$. On the grid below draw the graph of $g(x)$ for $-6 \le x \le 0$.

g(x) is a transformation 3 Left, up 2

→ Move the pts on f(x) Vertex = (−3, −3)

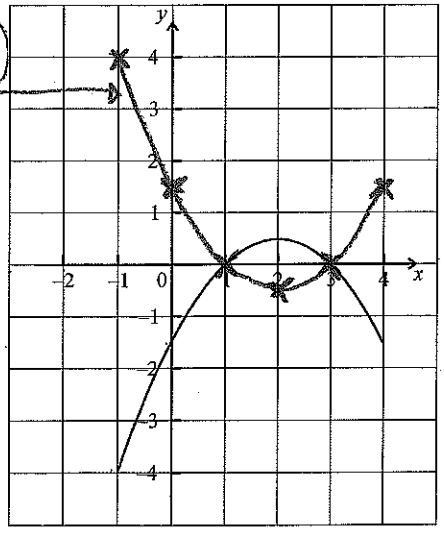


(c) What is the Range of g(x)?

Range: $\{g \mid g \ge -3\}$

look @ the graph!

3. Part of the graph of a function f is shown in the diagram below.



(a) On the same diagram sketch the graph of $y = -f(x)$.

Vertical Reflection (over x-axis)

x-intercepts do not move

(b) Let $g(x) = f(x+3)$.

i) Find $g(-3)$. $g(-3) = f(-3+3) = f(0) = -1\frac{1}{2}$

ii) Describe fully the transformation that maps the graph of f(x) to the graph of g(x).

Horizontal Translation

Left 3 units

4. Let $f(x) = 3x^2$. The graph of f is translated 1 unit to the right and 2 units down.

The graph of g is the image of the graph of f after this translation.

(a) Write down the coordinates of the vertex of the graph of g.

Vertex of $f(x) = (0,0) \longrightarrow (0+1, 0-2) = \boxed{(1,-2)}$

(b) Express g in the form $g(x) = 3(x-p)^2 + q$.

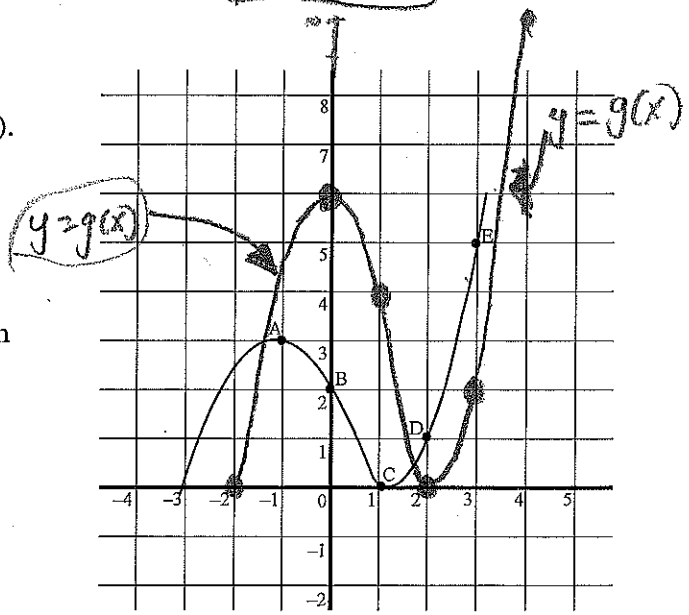
$p = 1$
$q = -2$
$\boxed{g(x) = 3(x-1)^2 - 2}$

The graph of h is the reflection of the graph of g over the x-axis.

(c) Write down the coordinates of the vertex of the graph of h.

Reflection over x-axis (vertical Reflection) changes sign of y-coordinate
points $(x,y) \longrightarrow (x,-y)$ so, $(1,-2) \longrightarrow \boxed{(1,+2)}$

5. The sketch shows part of the graph of $y = f(x)$ which passes through the points A(–1, 3), B(0, 2), C(1, 0), D(2, 1) and E(3, 5).



A second function is defined by $g(x) = 2f(x-1)$.

(a) Calculate $g(0)$, $g(1)$, $g(2)$ and $g(3)$.

(b) On the same axes, sketch the graph of the function $g(x)$.

$g(0) = 2 \cdot f(0-1) = 2 \cdot f(-1) = 2 \cdot 3 = 6$
$g(1) = 2 \cdot f(1-1) = 2 \cdot f(0) = 2 \cdot 2 = 4$
$g(2) = 2 \cdot f(2-1) = 2 \cdot f(1) = 2 \cdot 0 = 0$
$g(3) = 2 \cdot f(3-1) = 2 \cdot f(2) = 2 \cdot 1 = 2$

So we get the points:
$(0,6), (1,4), (2,0), (3,2)$ on the graph of $g(x)$
Plot these points we also get the pt $(-2,0)$ on $g(x)$