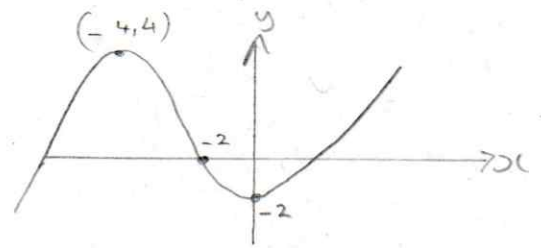
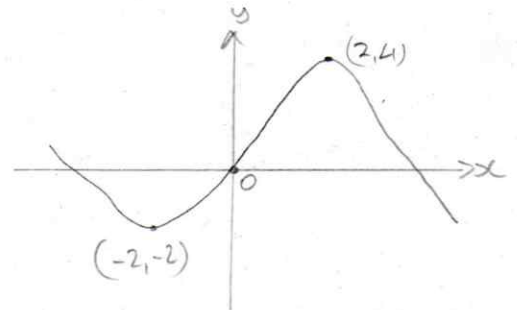


3. Graph Transformations

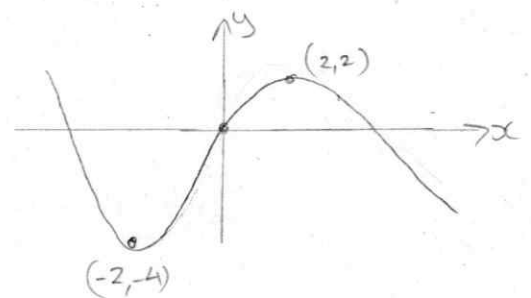
1. a) $f(x+2)$ $(-2, 4) \xrightarrow[\text{left 2}]{(x+2)}$ $(-4, 4)$
 $(0, 0) \rightarrow (-2, 0)$
 $(2, -2) \rightarrow (0, -2)$



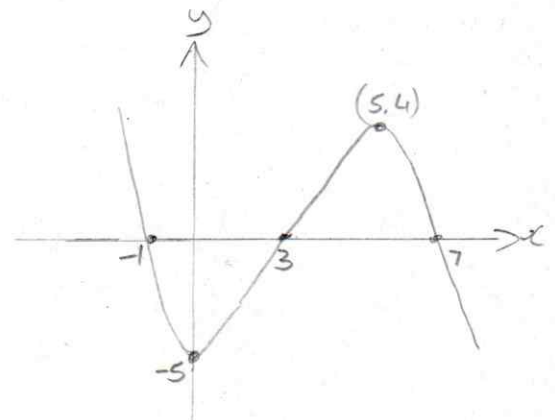
b) $f(-x)$ $(-2, 4) \xrightarrow[\text{flip y-axis}]{(-x)}$ $(2, 4)$
 $(0, 0) \rightarrow (0, 0)$
 $(2, -2) \rightarrow (-2, -2)$



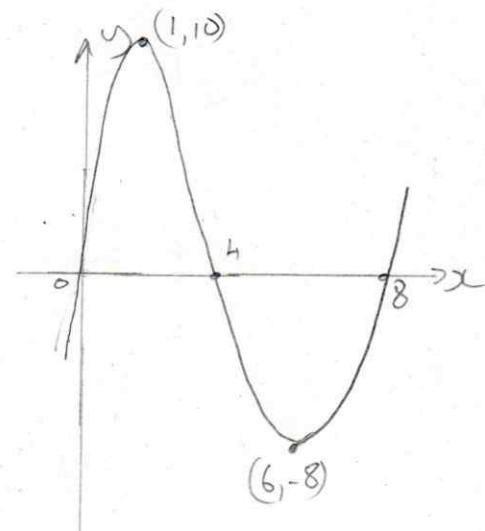
c) $-f(x)$ $(-2, 4) \xrightarrow[\text{flip x-axis}]{-f(x)}$ $(-2, -4)$
 $(0, 0) \rightarrow (0, 0)$
 $(2, -2) \rightarrow (2, 2)$



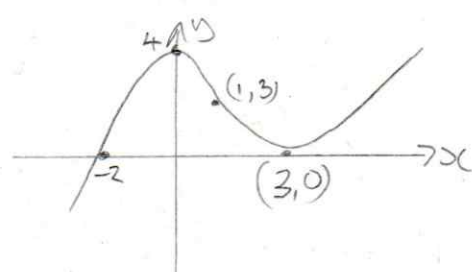
2 a) $f(x+1)$ $(0, 0) \xrightarrow[\text{left 1}]{(x+1)}$ $(-1, 0)$
 $(1, -5) \rightarrow (0, -5)$
 $(4, 0) \rightarrow (3, 0)$
 $(6, 4) \rightarrow (5, 4)$
 $(8, 0) \rightarrow (7, 0)$



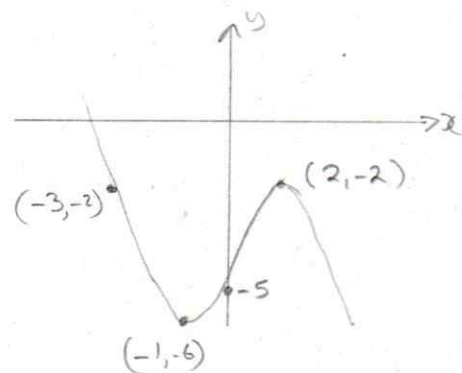
b) $-2f(x)$ $(0, 0) \xrightarrow[\text{flip x-axis}]{-f(x)}$ $(0, 0) \xrightarrow[\text{stretch vertical}]{2f(x)}$ $(0, 0)$
 $(1, -5) \rightarrow (1, 5) \rightarrow (1, 10)$
 $(4, 0) \rightarrow (4, 0) \rightarrow (4, 0)$
 $(6, 4) \rightarrow (6, -4) \rightarrow (6, -8)$
 $(8, 0) \rightarrow (8, 0) \rightarrow (8, 0)$



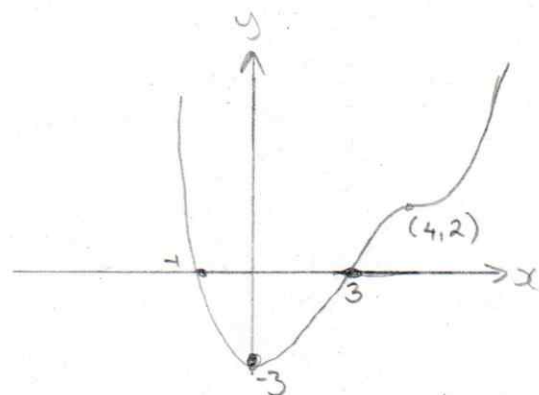
3a) $f(x-1)$ $(-3,0) \rightarrow (-2,0)$ $(x-1)$ move 1 right
 $(-1,4) \rightarrow (0,4)$
 $(0,3) \rightarrow (1,3)$
 $(2,0) \rightarrow (3,0)$



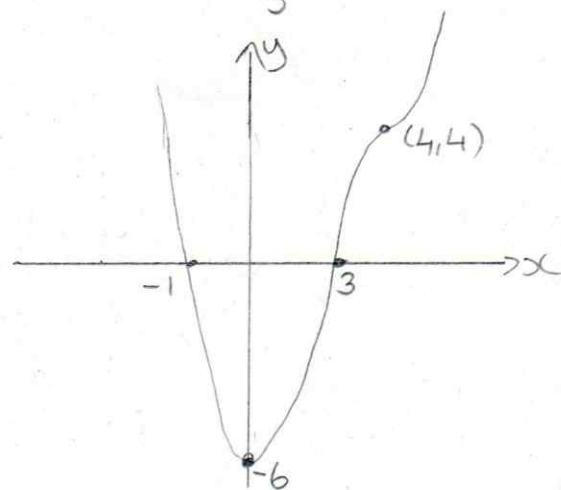
b) $-f(x)-2$ $(-3,0) \rightarrow (-3,0) \xrightarrow{(-2) \text{ down } 2} (-3,-2)$ $-f(x)$ flip x-axis
 $(-1,4) \rightarrow (-1,-4) \rightarrow (-1,-6)$
 $(0,3) \rightarrow (0,-3) \rightarrow (0,-5)$
 $(2,0) \rightarrow (2,0) \rightarrow (2,-2)$



4 a) $f(-x)$ $(-4,2) \rightarrow (4,2)$ $f(-x)$ flip y-axis
 $(-3,0) \rightarrow (3,0)$
 $(0,-3) \rightarrow (0,-3)$
 $(1,0) \rightarrow (-1,0)$



b) $2f(-x)$ $(4,2) \xrightarrow{\text{From (a)}} (4,4)$ $2(\dots)$ stretch vertic
 $(3,0) \rightarrow (3,0)$
 $(0,-3) \rightarrow (0,-6)$
 $(-1,0) \rightarrow (-1,0)$

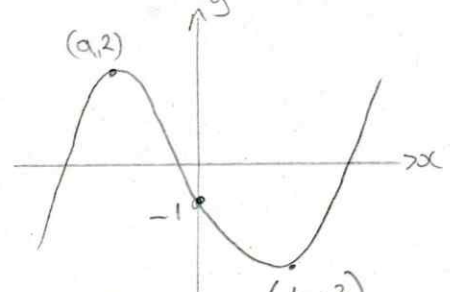


5a) $-g(x)$

$(a, -2) \rightarrow (a, 2)$ (flip across x-axis)

$(0, 1) \rightarrow (0, -1)$

$(b, 3) \rightarrow (b, -3)$



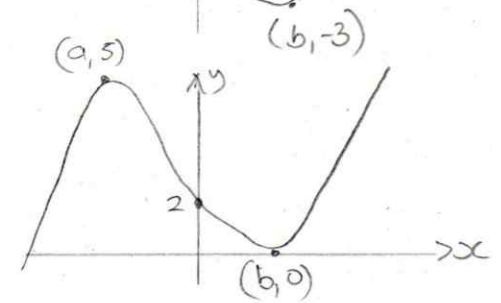
b) $3 - g(x)$
same as
 $-g(x) + 3$

From (a) $\nearrow$ $+3$ (up y-axis)

$(a, 2) \rightarrow (a, 5)$

$(0, -1) \rightarrow (0, 2)$

$(b, -3) \rightarrow (b, 0)$

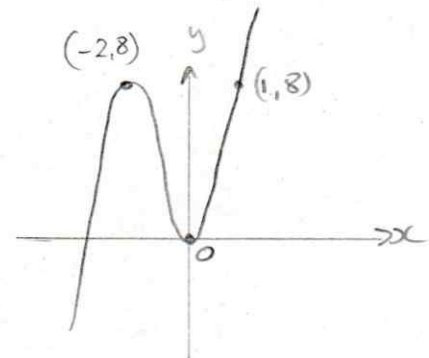


6a) $f(2x)$

$(-4, 8) \rightarrow (-2, 8)$ (2x) stretch/compress horiz

$(0, 0) \rightarrow (0, 0)$

$(2, 8) \rightarrow (1, 8)$



b) $1 - f(2x)$
same as
 $-f(2x) + 1$

From (a) $f(2x)$ $\xrightarrow{\text{flip x-axis}}$ $-f(2x)$ $\xrightarrow{\text{up y-axis}}$ $-f(2x) + 1$

$(-2, 8) \rightarrow (-2, -8) \rightarrow (-2, -7)$

$(0, 0) \rightarrow (0, 0) \rightarrow (0, 1)$

$(1, 8) \rightarrow (1, -8) \rightarrow (1, -7)$

