Transformation and quadratic function

Thursday, November 5, 2020 5:53 AM

1) Reflection. $y = x^2 \longrightarrow y = -x^2$

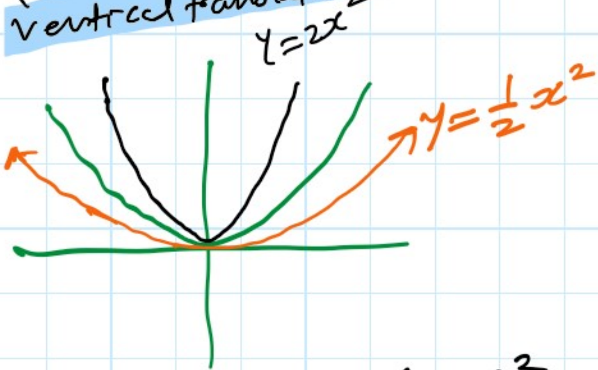
2) Streches ($y = ax^2$) — Vertical strech. $y = 2x^2$ $(a > 1)$
— vertical compression. $y = \frac{1}{2}x^2$ $(a < 1)$

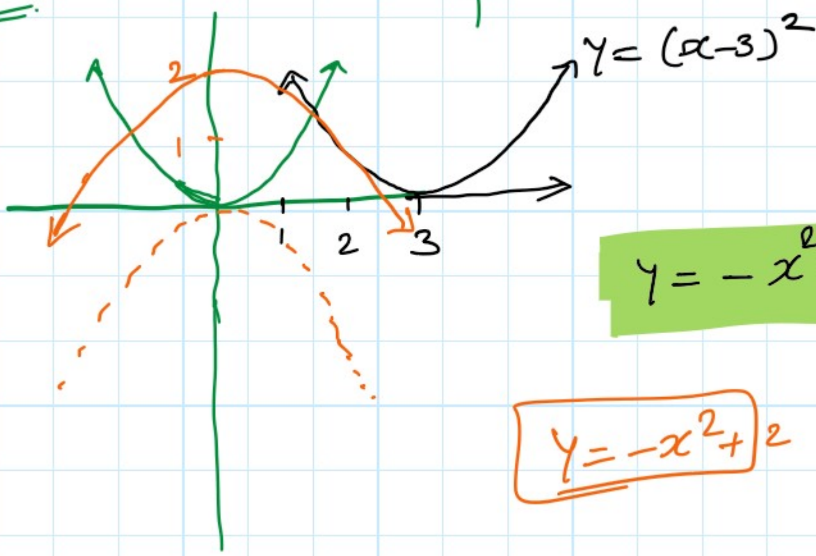
3) Translations.
Horizontal
Vertical translation. $\rightarrow y = x^2 + k$.

$y = (x-3)^2$

$x - 3 = 0$

$x = 3$





$y = -x^2 + 2$

$\boxed{y = -x^2 +} 2$

Transformation of $y = x^2$

Reflection in the x axis.
$y = -x^2$

Vertical translation
$y = x^2 + k$
up k units for $k > 0$
Down $|k|$ unit $k < 0$

Vertical strech & scale factor $|a|$

Horizontal translation

Vertical strech → scale factor $|a|$

vertical strech $|a| > 1$

vertical compression $0 < |a| < 1$

Horizontal translation $y = (x-h)^2$

Right h units $h>0$

left $|h|$ units $h<0$

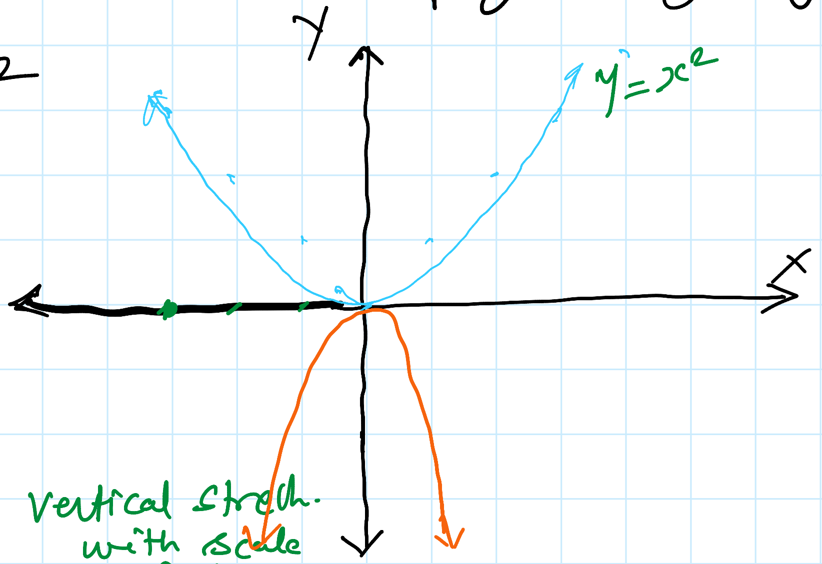
Ex

sketch $y = x^2$

graph $y = g(x)$ on the same axes

co-ordinate of vertex, axis of symmetry fing

a) $g(x) = \frac{1}{2}x^2$



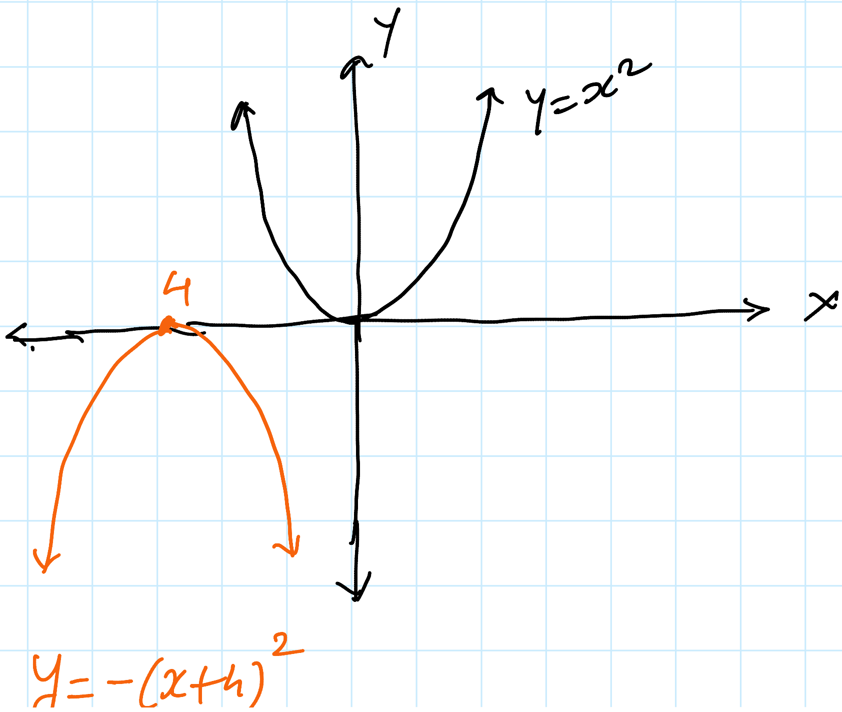
b) $g(x) = (x+3)^2 - 2$

c) $g(x) = 2x^2 + 3$

d) $g(x) = -3x^2$

vertical strech. with scale factor 3 & 3 units up.

Ex



$y = -(x+4)^2$

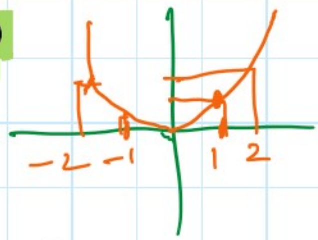
$y = -(x+h)^2$

$\underline{y = f(x)}$ — Reflection in the y-axis.

$y = f(-x)$

→ Reflection in the x-axis.

$y = -f(x)$



Vertical dilation:

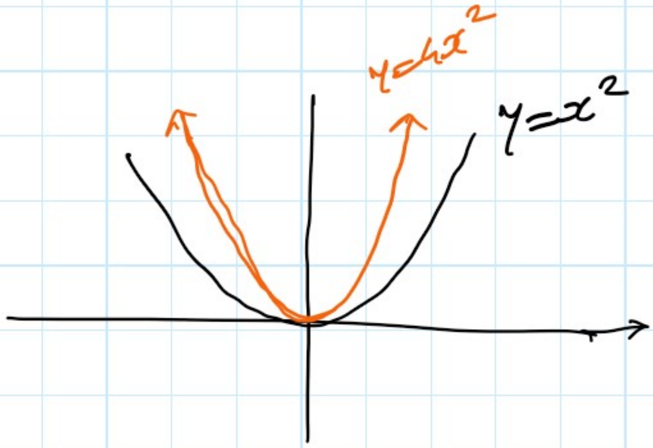
$y = af(x)$ — strech $|a| > 1$ / compressed $|a| < 1$

Horizontal dilation:

$y = f(ax)$ — $|a| > 1$ — H. compression

$0 < |a| < 1$ — H. stretch

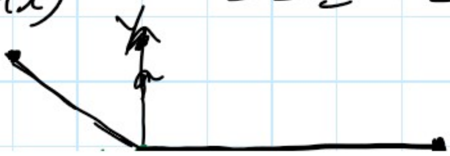
$y = x^2$

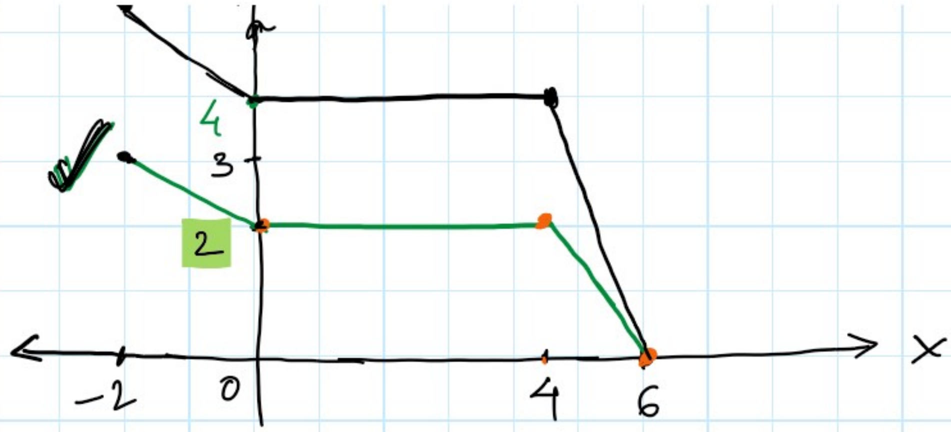


$y = (2x)^2$

$\boxed{y = 4x^2}$

Ex $y = f(x)$ $-2 \le x \le 6$





sketch. graph.

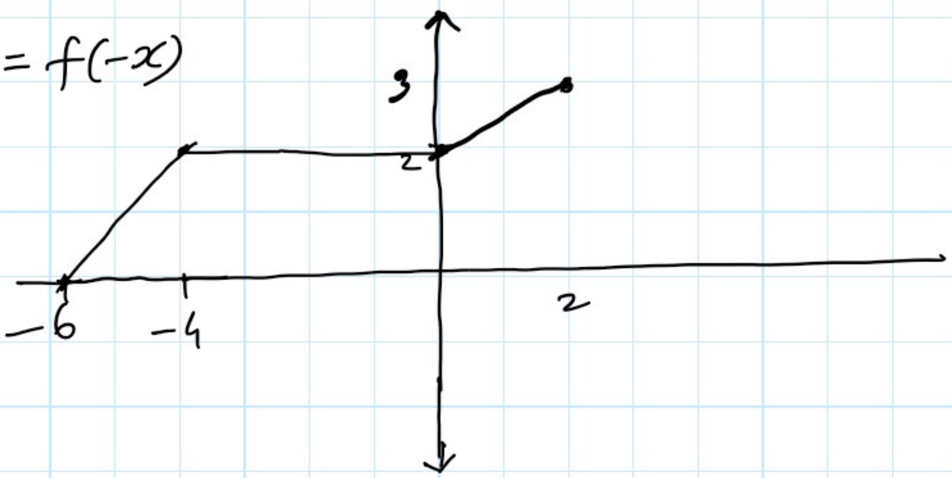
a) $y = 2f(x)$

— $x = 6,\ y = 0$

$y = 2f(x) \xrightarrow{x=6} y = 2f(6)$

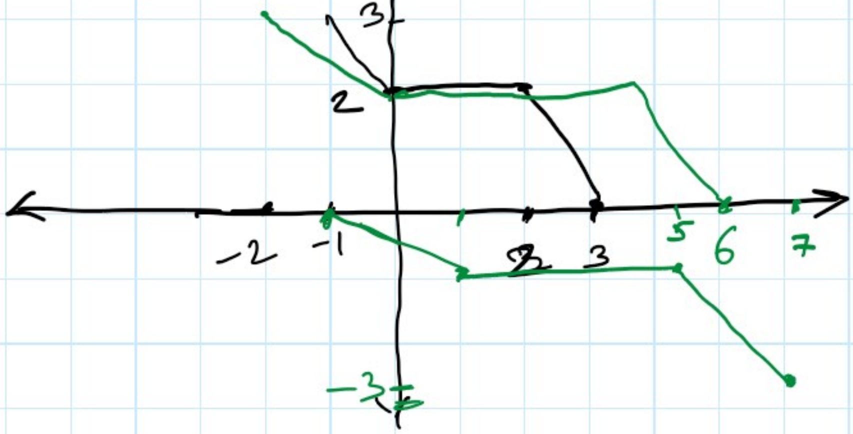
$\boxed{y = f(x)}$

b) $y = f(-x)$



c) $y = f(2x)$

scale factor $= \left(\frac{1}{2}\right)$



d) $y = f(x-1) - 3$

$f(x) = \underline{ax^2+bx+c}$. $\quad (a \neq 0)$

1) Vertex form:. $\quad f(x) = a(x-h)^2 + K$. $\quad a \neq 0$

$V = (h, K)$

axis of symmetry.-($x = h$)

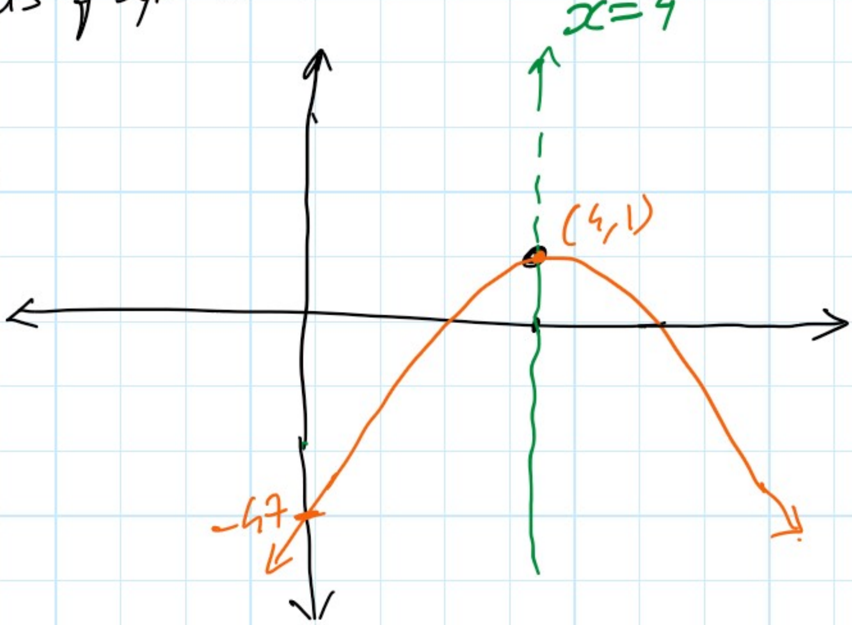
a) $f(x) = -3(x-4)^2 + 1$.

Vertex = $(4, 1)$

axis of sym : $x = 4$

Y- intercept $\rightarrow$ $x = 0$.

$f(0) = -47$



b) $f(x) = 2(x+3)^2 - 6$

General form:

$f(x) = ax^2 + bx + c \quad (a \neq 0)$

$x = \frac{-b}{2a}$.

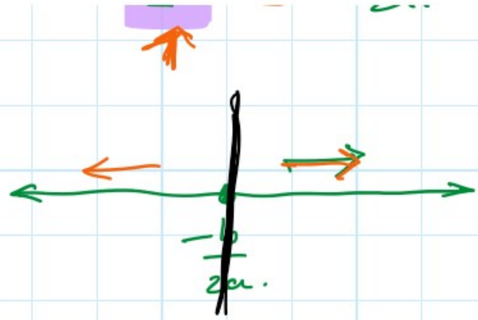
(axis of symmetry).

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

$= \frac{-b}{2a} \pm \frac{\sqrt{b^2-4ac}}{2a}$.

Vertex $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$

Vertex: $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$

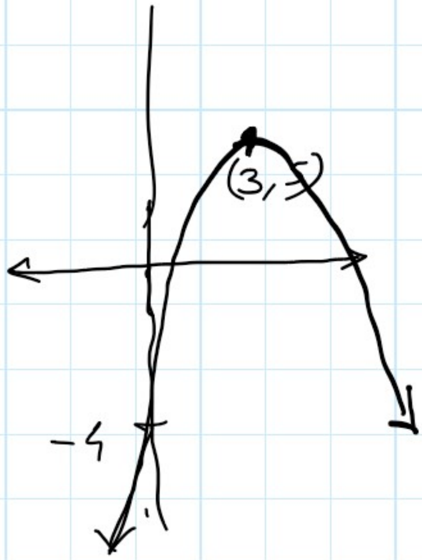


y-intercept: $(0, c)$

Ex: $f(x) = -x^2 + 6x - 4$

$\frac{-b}{2a} = \frac{-6}{2(-1)} = 3.$ $\boxed{x = 3}$

$f(3) = 5$



Ex: $f(x) = 2x^2 + 4x - 1$