



Lesson
Objectives:

Developing students will be able to transform graphs in the form $y = f(x + a)$ and $y = f(x) + a$.

Secure students will be able to transform graphs in the form $y = -f(x)$ and $y = f(-x)$.

Excelling students will be able to transform graphs in the form $y = af(x)$ and $y = f(ax)$.

Starter

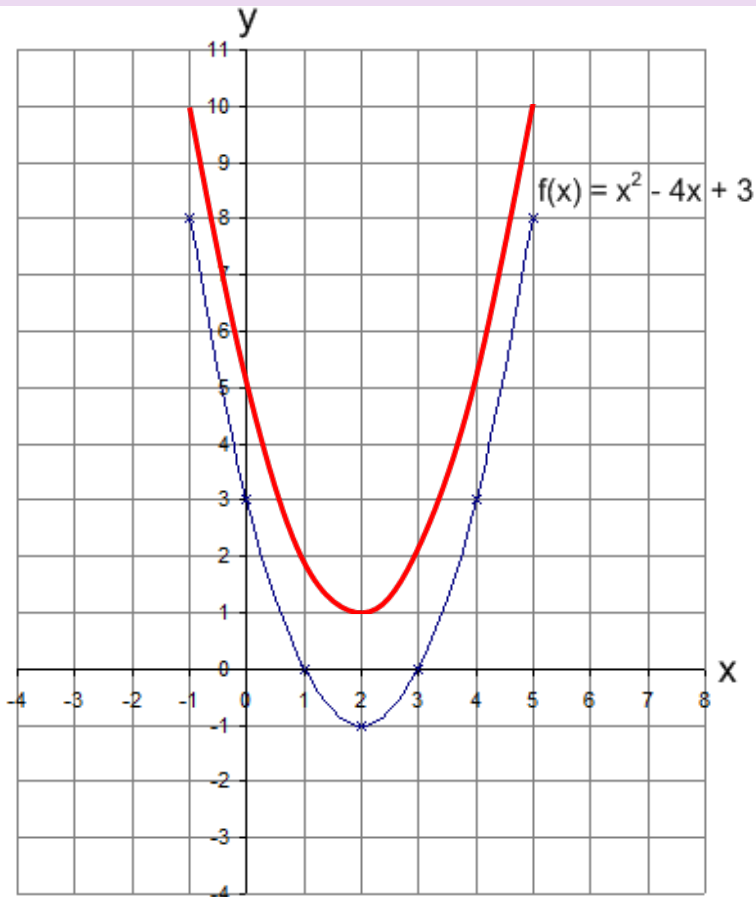
Use your prior knowledge of sketching quadratics using a table of values to complete the transformations investigation.

Keywords

Graph, transform, enlarge, translate, reflect, stretch, squash, scale factor, vector, coordinate, object, image

a) $f(x) + 2 = x^2 - 4x + 5$

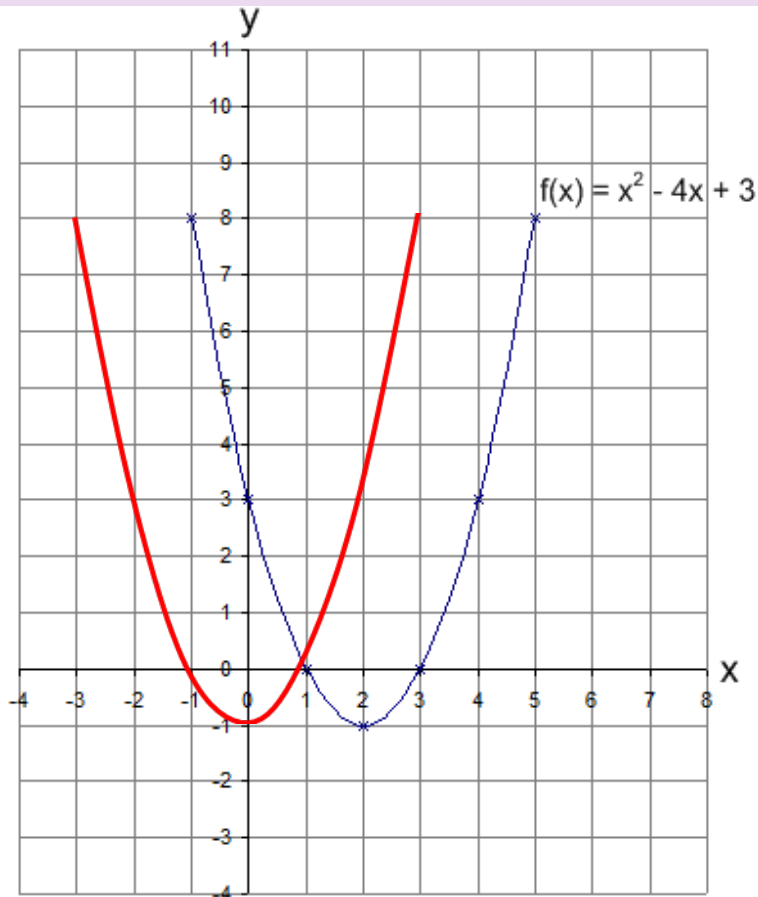
x	-1	0	1	2	3	4	5
y	10	5	2	1	2	5	10



2 units higher

b) $f(x + 2) = x^2 - 1$

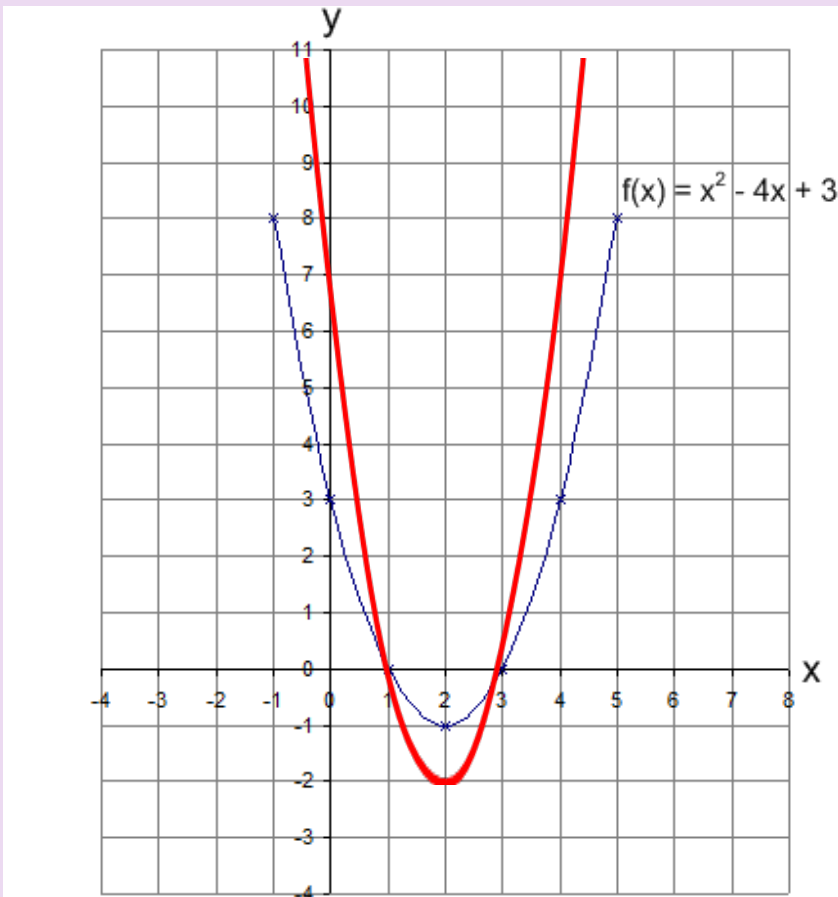
x	-3	-2	-1	0	1	2	3
y	8	3	0	-1	0	3	8



2 units left

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

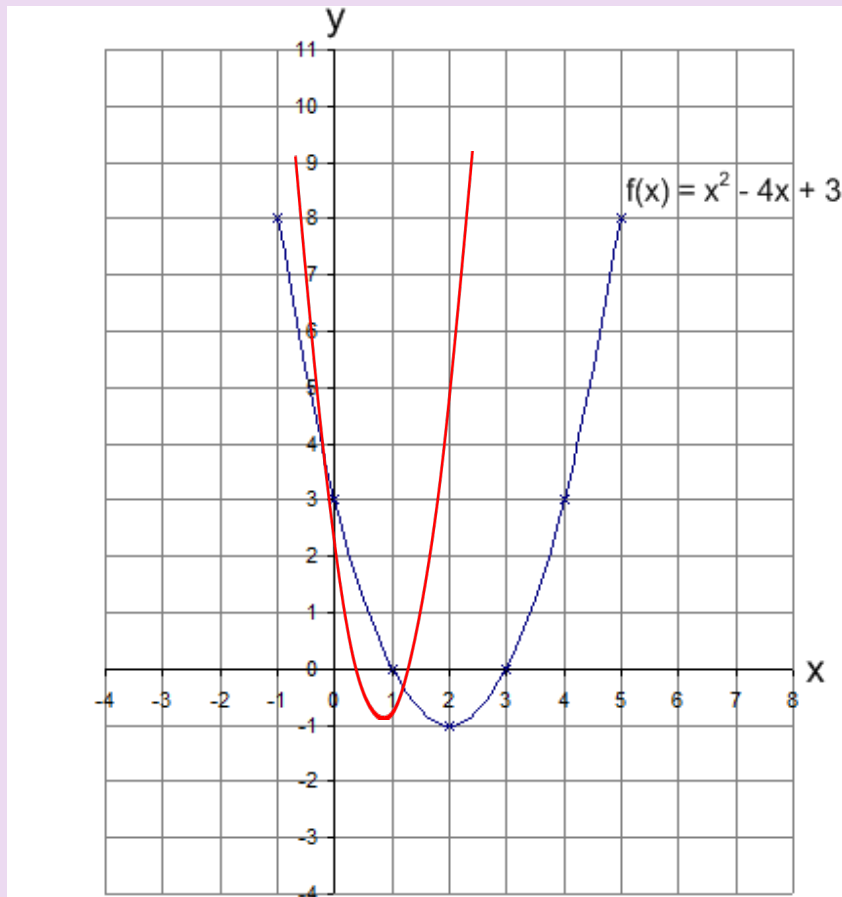
x	-1	0	1	2	3	4	5
y	16	6	0	-2	0	6	16



Stretched by scale factor 2 in the y-axis

d) $f(2x) = 4x^2 - 8x + 3$

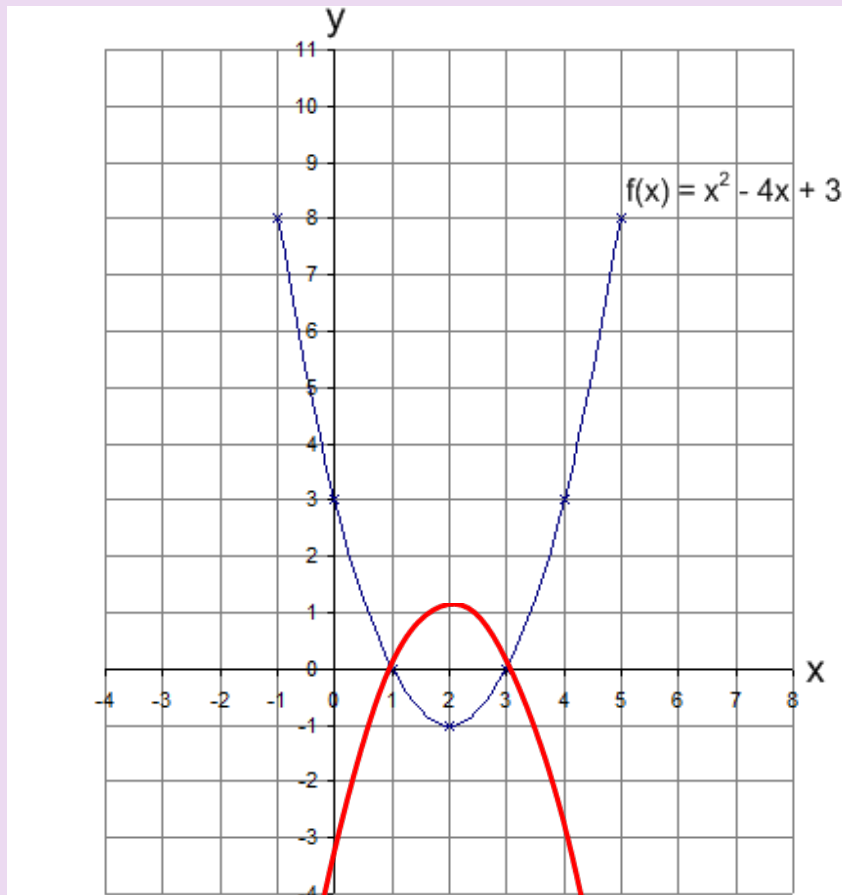
x	-1	0	1	2	3
y	15	3	-1	3	15



Stretched by scale factor $\frac{1}{2}$ in the x -axis

e) $-f(x) = -x^2 + 4x - 3$

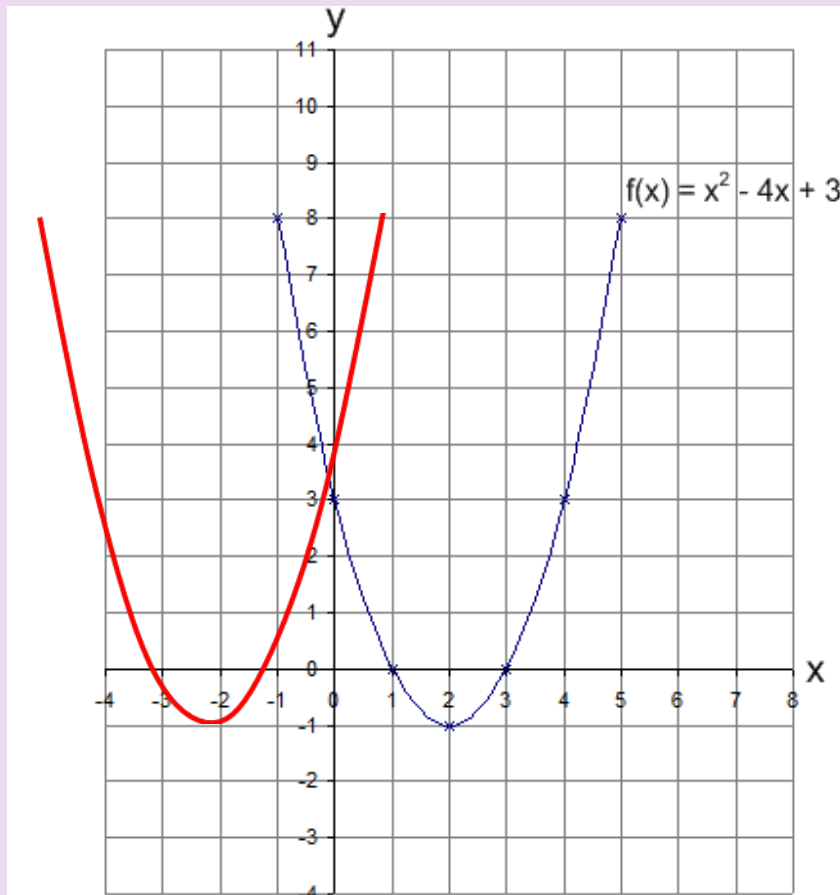
x	-1	0	1	2	3	4	5
y	-8	-3	0	1	0	-3	-8



Reflected in the x -axis

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

x	-5	-4	-3	-2	-1	0	1
y	8	3	0	-1	0	3	8



Reflected in the y-axis

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Translations Task

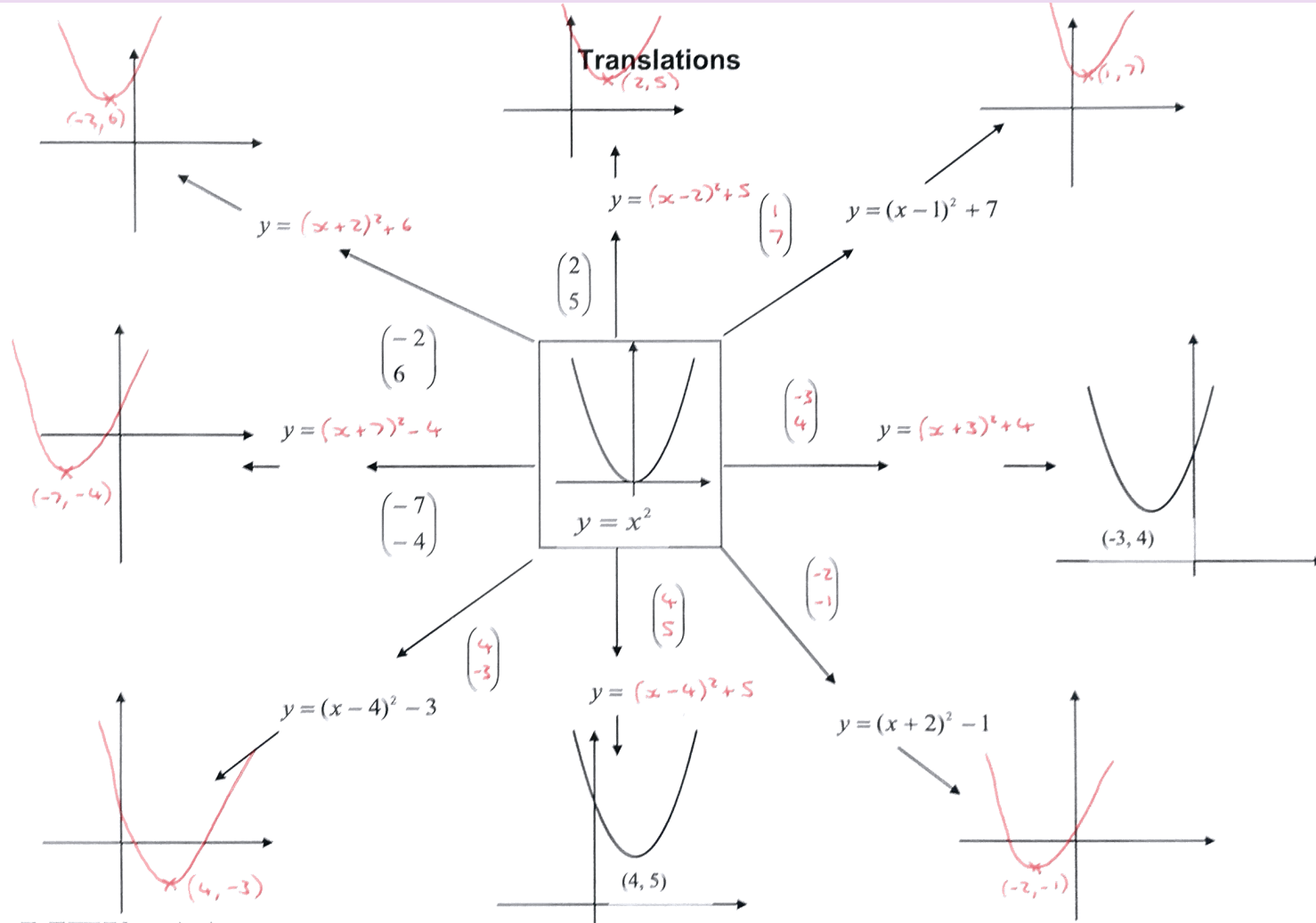
Thinking just about translations, can you complete the three pieces of information for each translation of $y = x^2$.

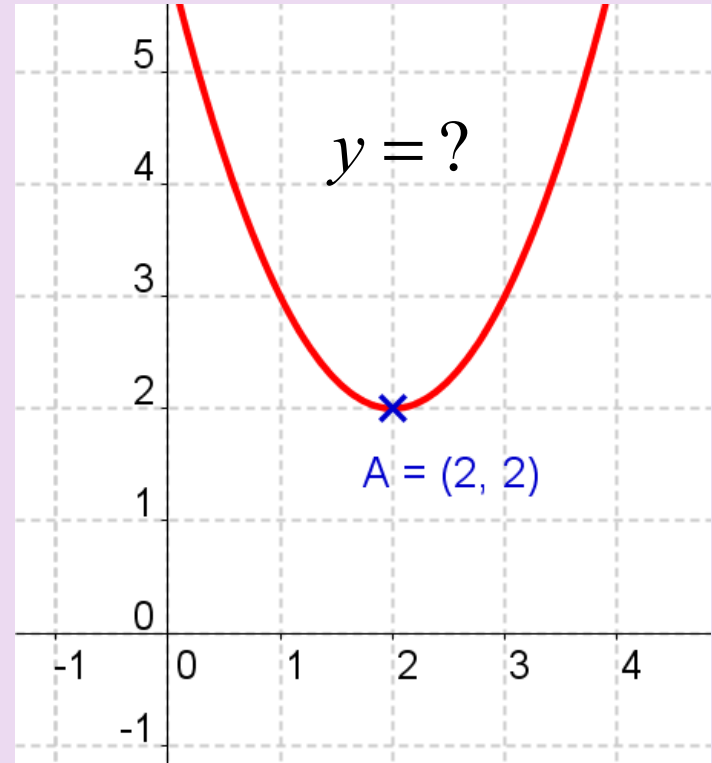
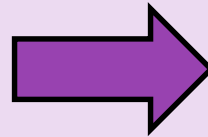
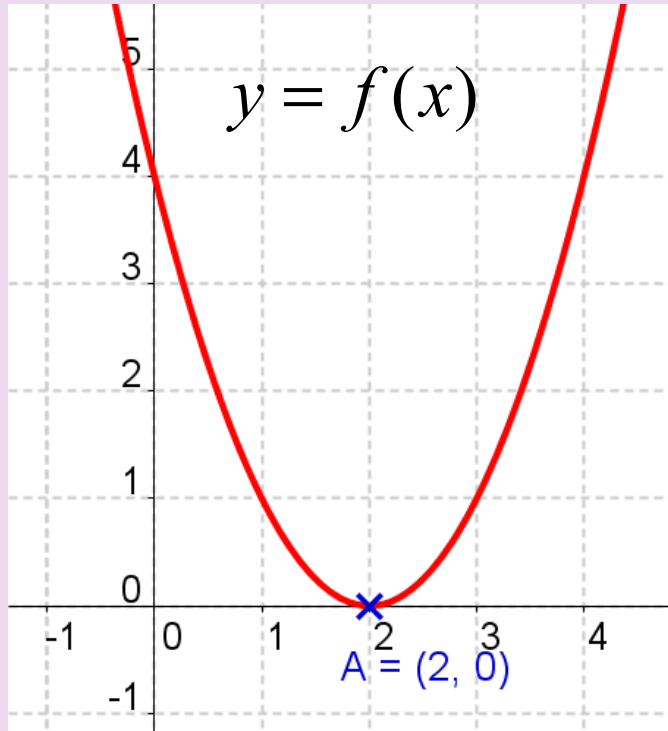
Each translation will need a vector, an equation and a sketch with the minimum point labelled.

Keywords

Graph, transform, enlarge, translate, reflect, stretch, squash, scale factor, vector, coordinate, object, image

Answers





A

$$y = f(x) + 2$$

B

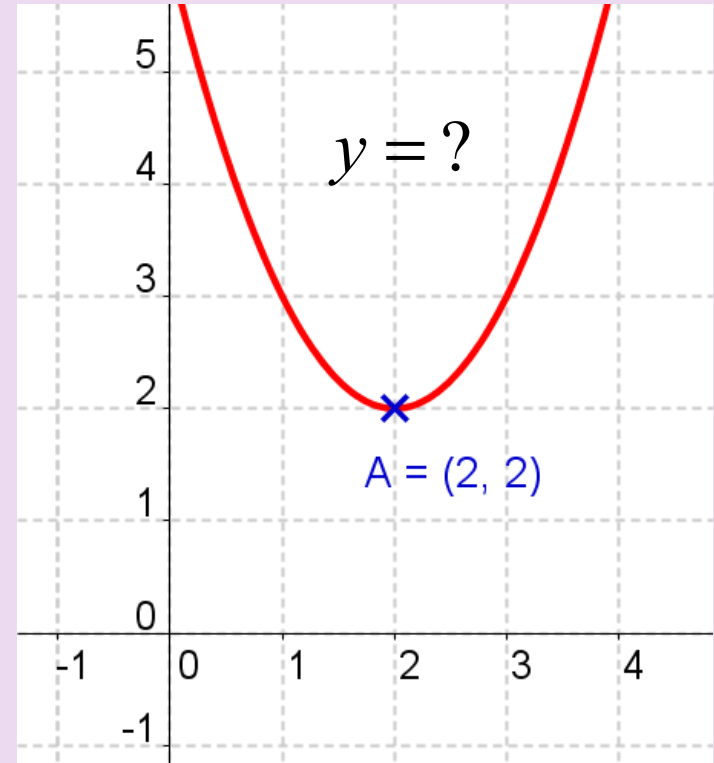
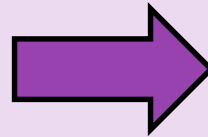
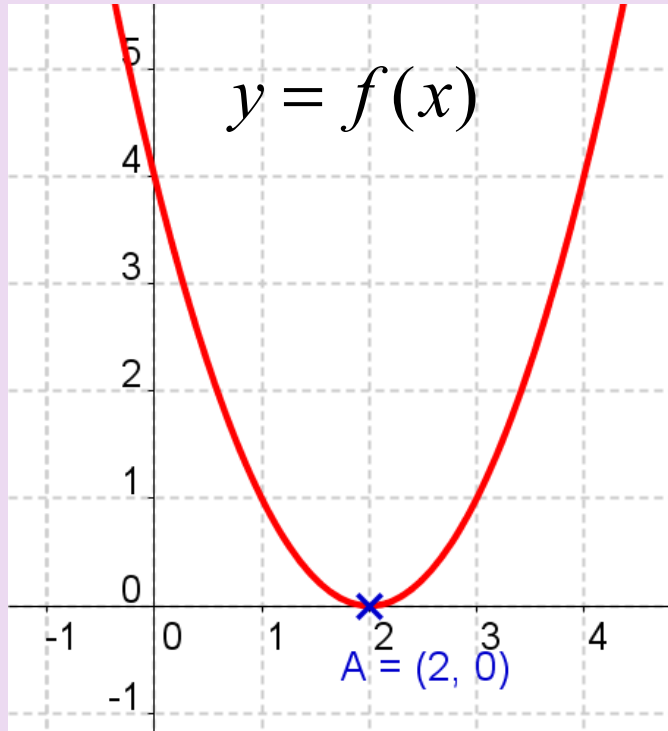
$$y = f(x) - 2$$

C

$$y = f(x + 2)$$

D

$$y = f(x - 2)$$



A

$$y = f(x) + 2$$

B

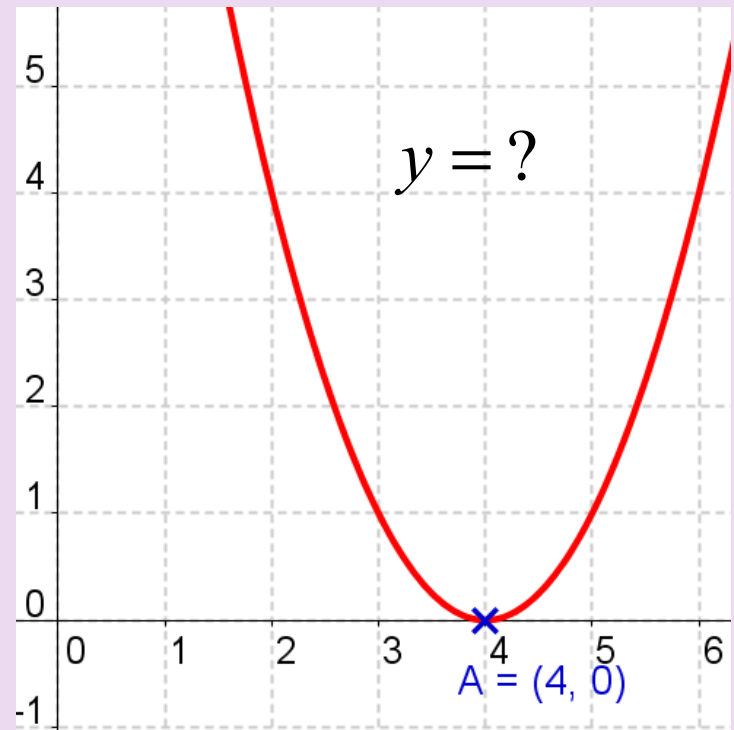
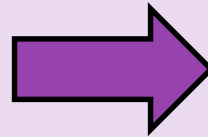
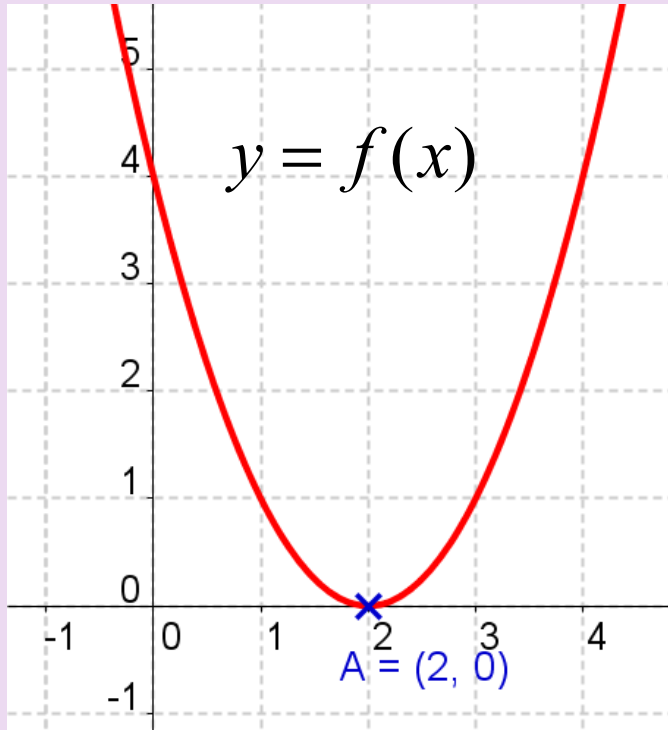
$$y = f(x) - 2$$

C

$$y = f(x + 2)$$

D

$$y = f(x - 2)$$



A

$$y = f(x) + 2$$

B

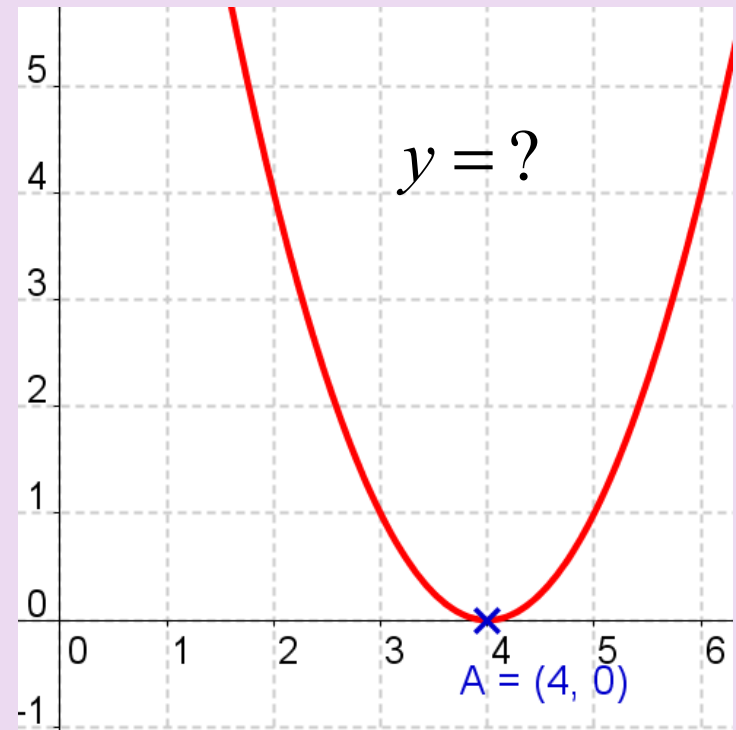
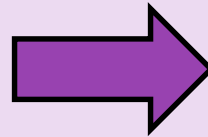
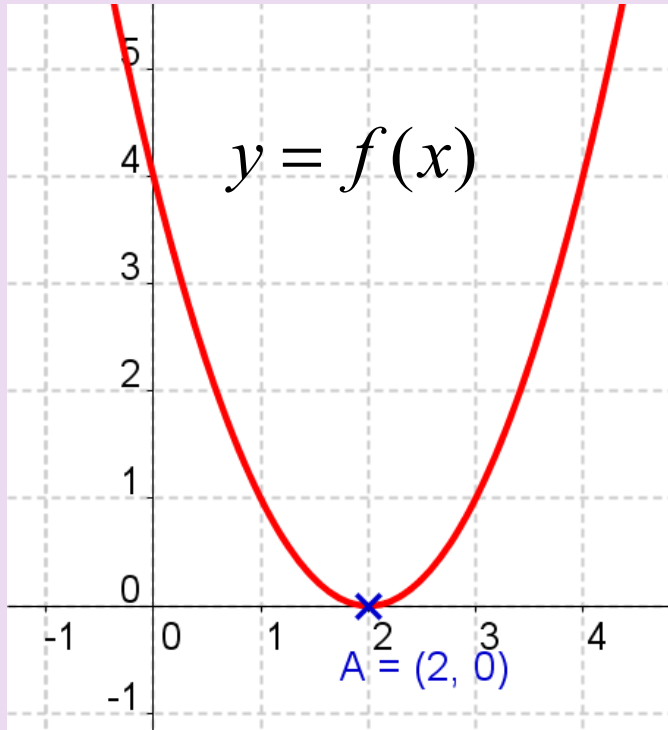
$$y = f(x) - 2$$

C

$$y = f(x + 2)$$

D

$$y = f(x - 2)$$



A

$$y = f(x) + 2$$

B

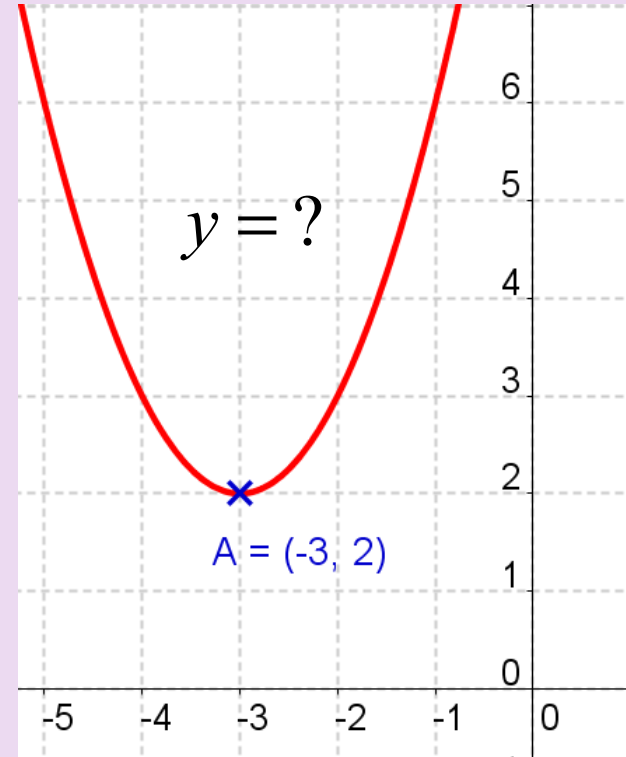
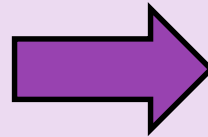
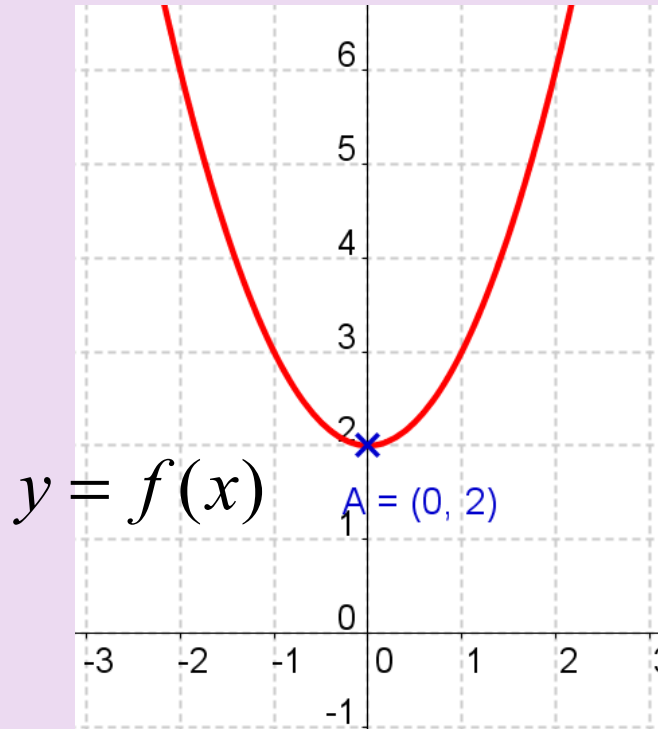
$$y = f(x) - 2$$

C

$$y = f(x + 2)$$

D

$$y = f(x - 2)$$



A

$$y = f(x) + 3$$

B

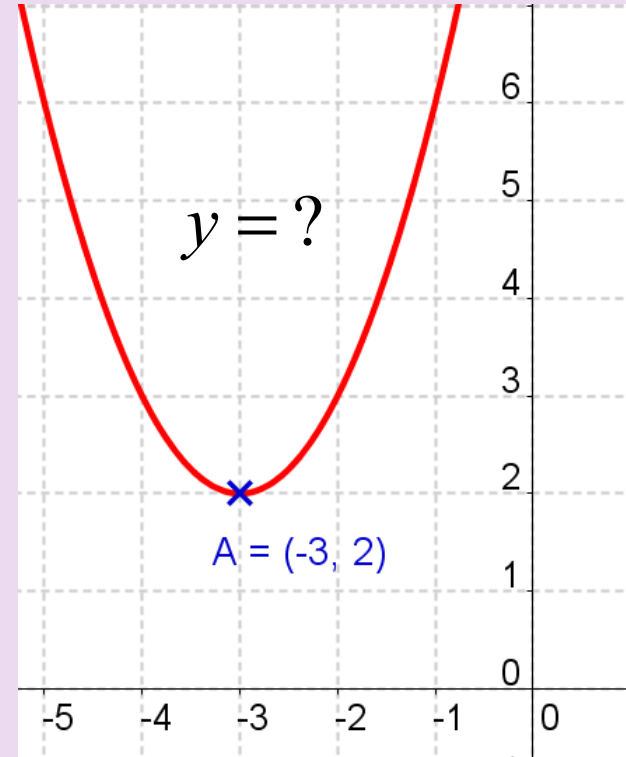
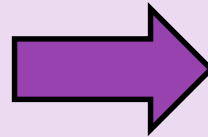
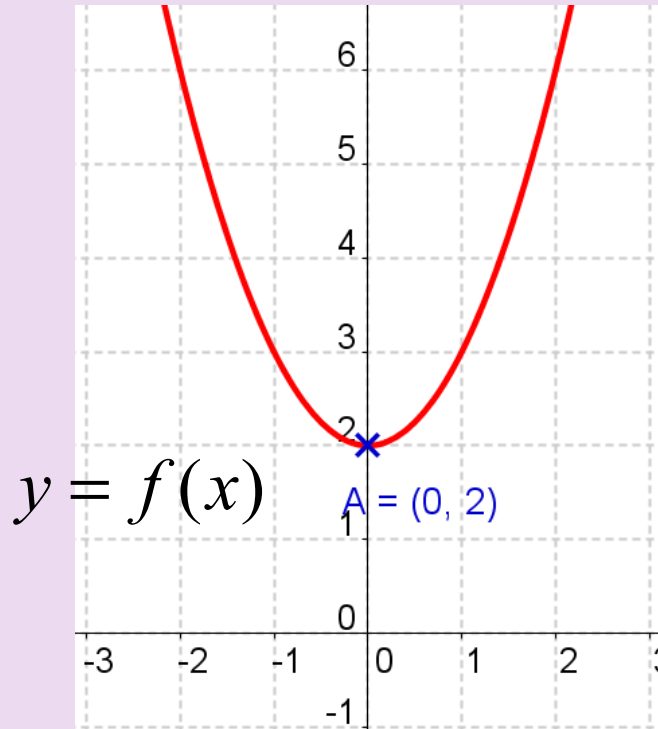
$$y = f(x) - 3$$

C

$$y = f(x + 3)$$

D

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



A

$$y = f(x) + 3$$

B

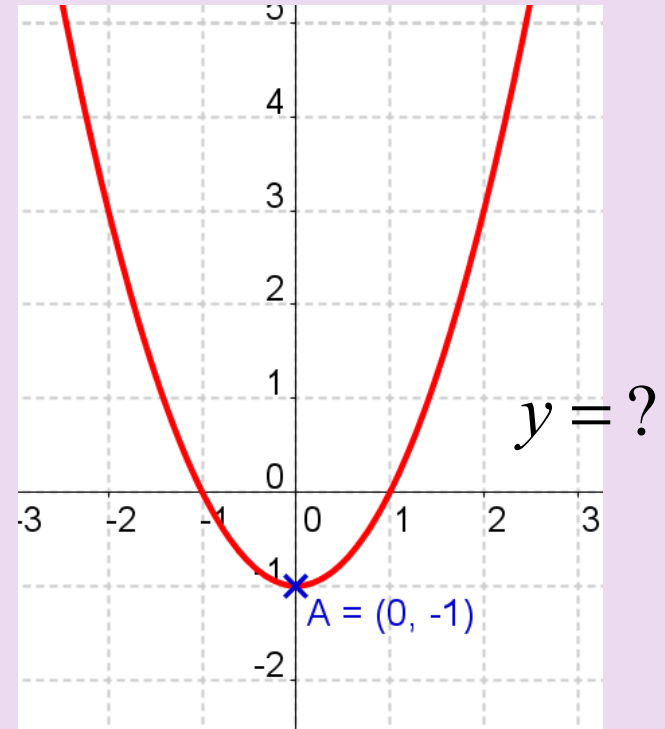
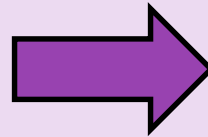
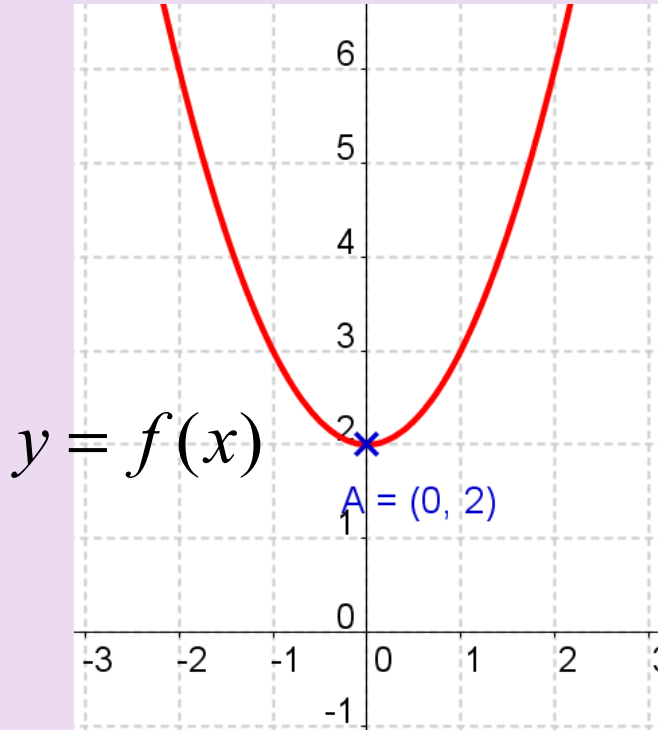
$$y = f(x) - 3$$

C

$$y = f(x + 3)$$

D

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



A

$$y = f(x) + 3$$

B

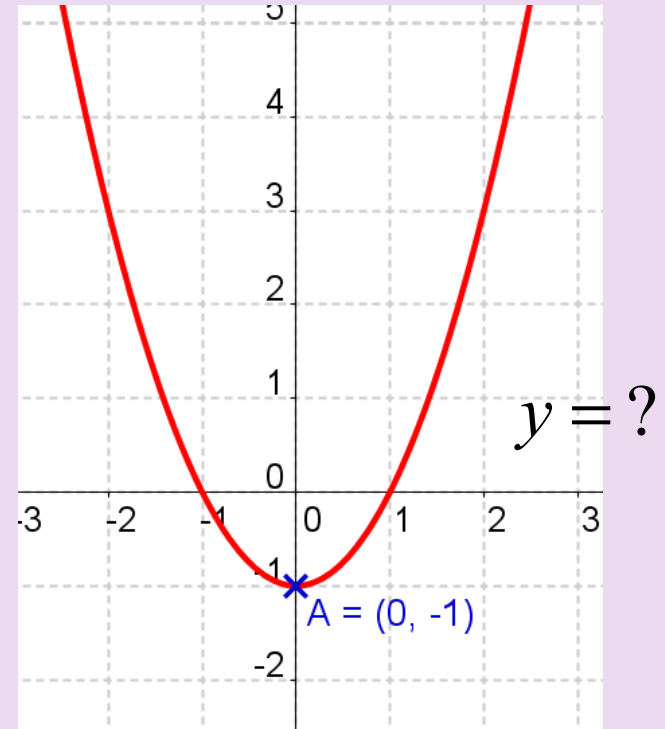
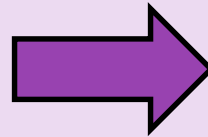
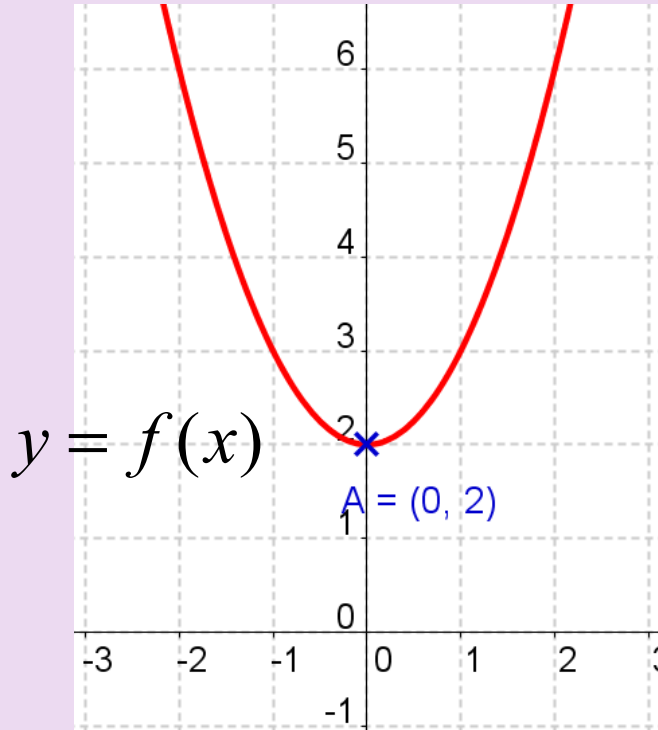
$$y = f(x) - 3$$

C

$$y = f(x + 3)$$

D

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



A

$$y = f(x) + 3$$

B

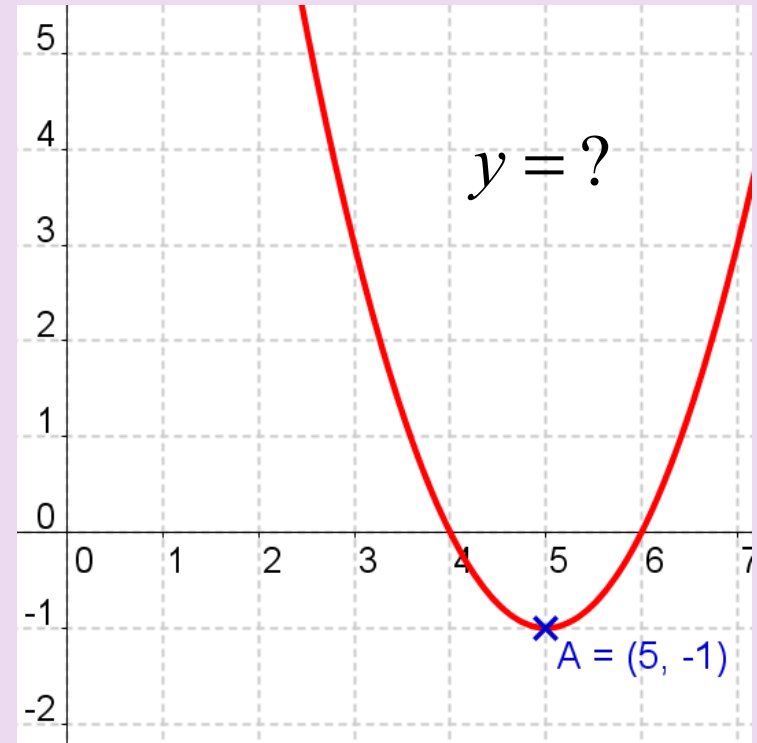
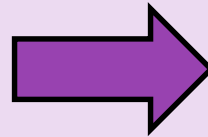
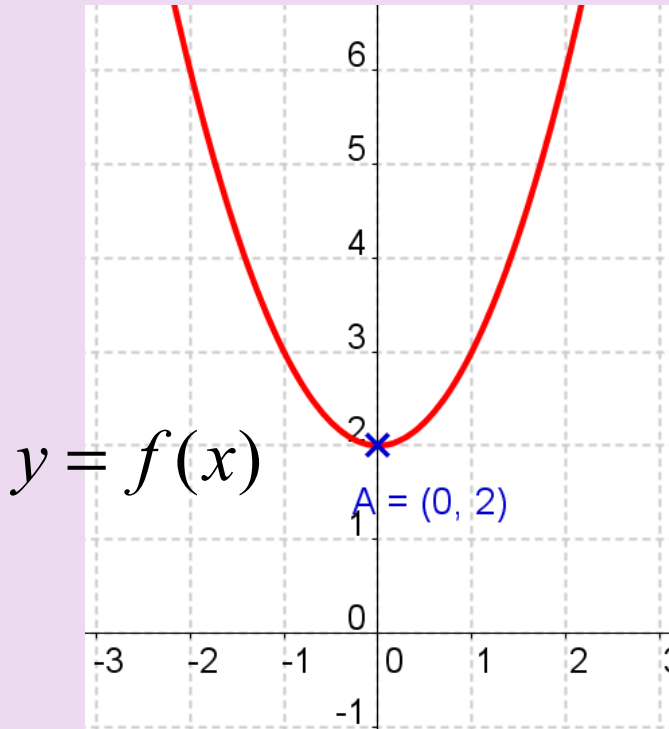
$$y = f(x) - 3$$

C

$$y = f(x + 3)$$

D

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



A

$$y = f(x + 5) + 3$$

B

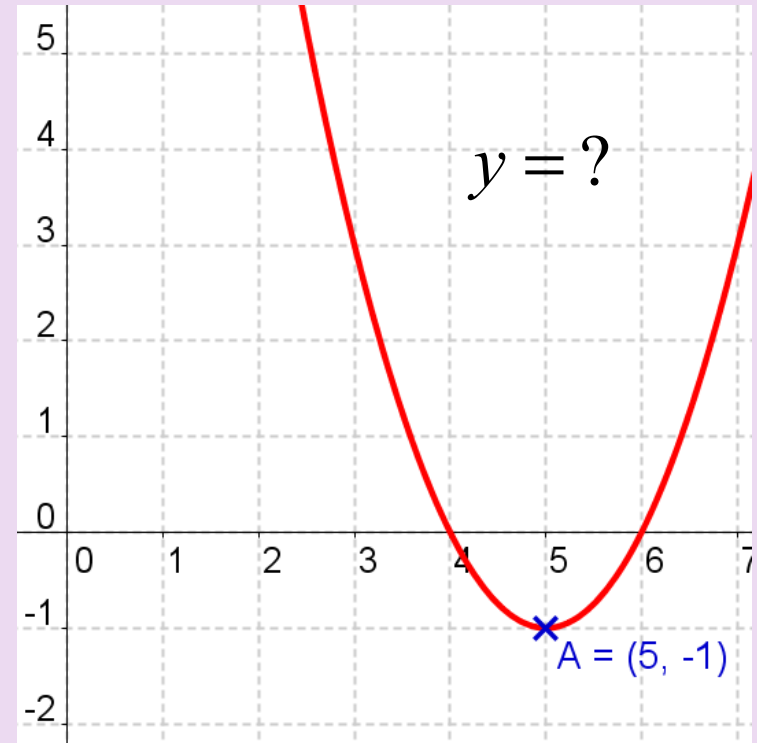
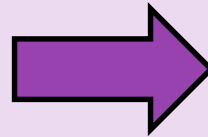
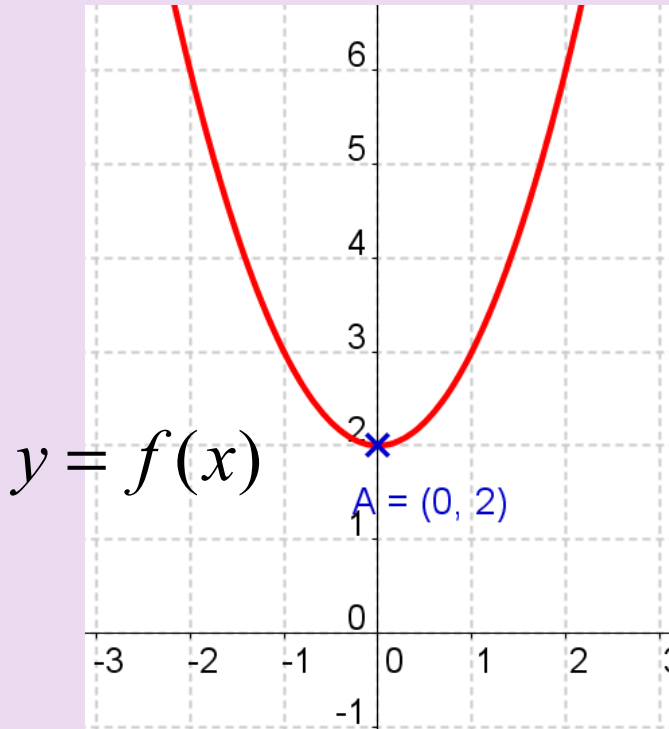
$$y = f(x - 5) - 3$$

C

$$y = f(x + 5) - 3$$

D

$$y = f(x - 5) + 3$$



A

$$y = f(x + 5) + 3$$

B

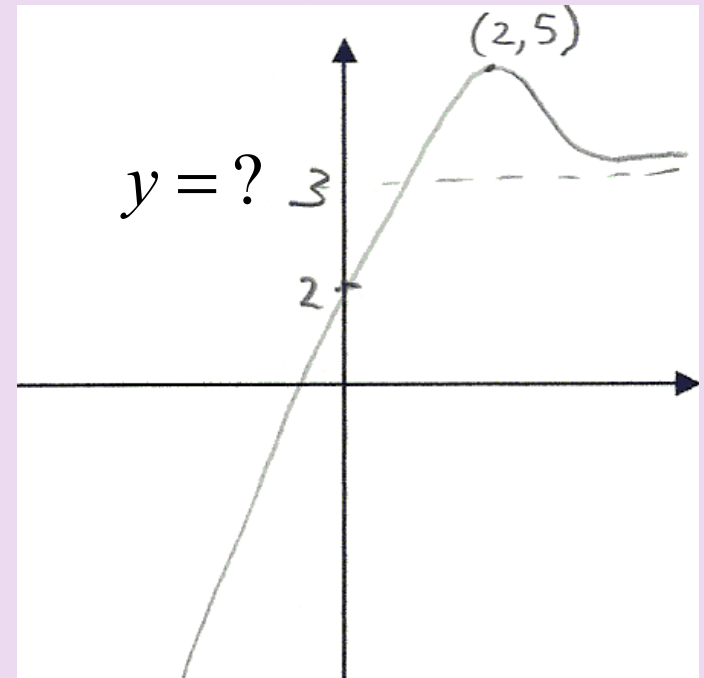
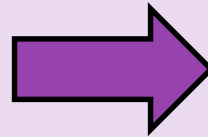
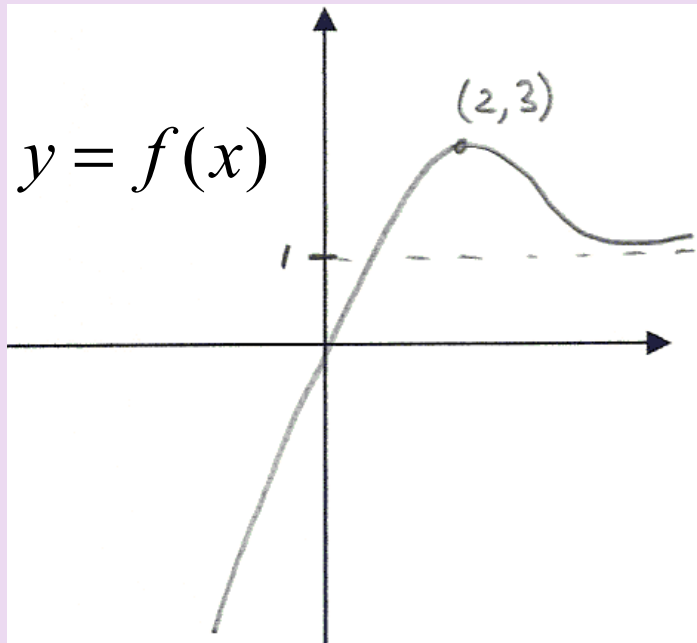
$$y = f(x - 5) - 3$$

C

$$y = f(x + 5) - 3$$

D

$$y = f(x - 5) + 3$$



A

$$y = f(x) + 2$$

B

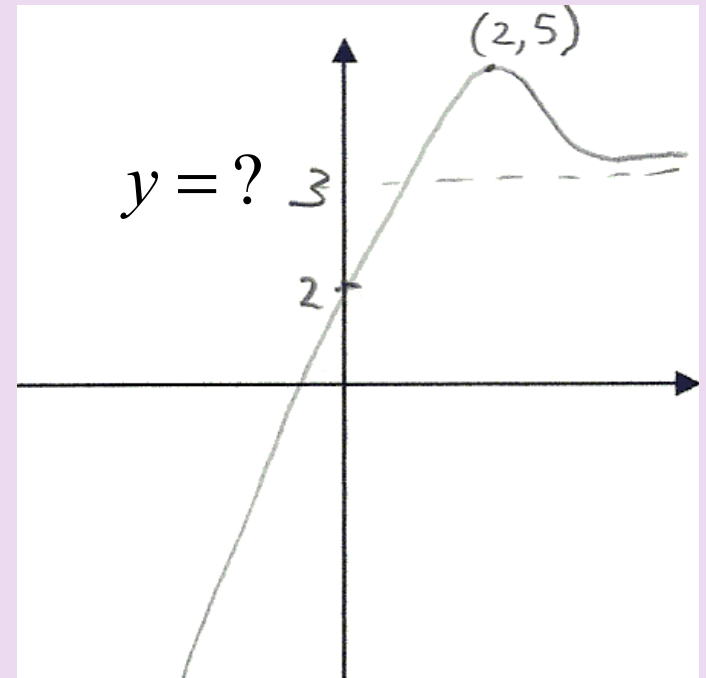
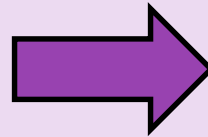
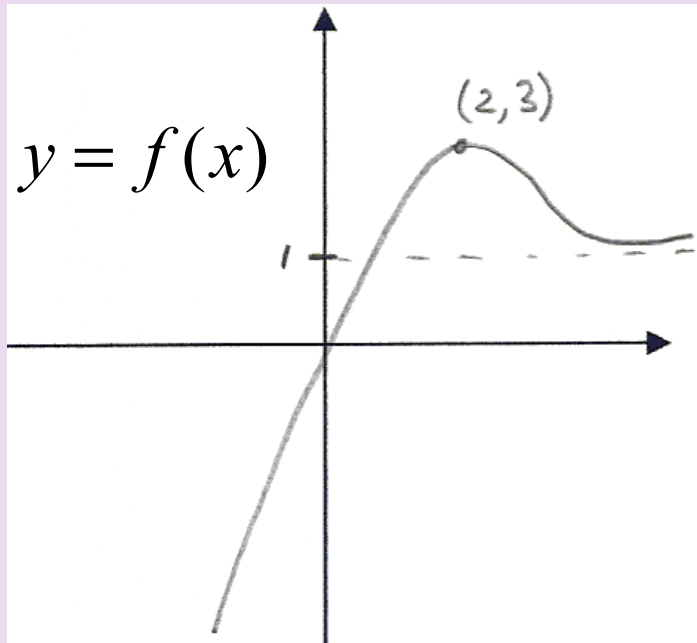
$$y = f(x) - 2$$

C

$$y = f(x + 2)$$

D

$$y = f(x - 2)$$



A

$$y = f(x) + 2$$

B

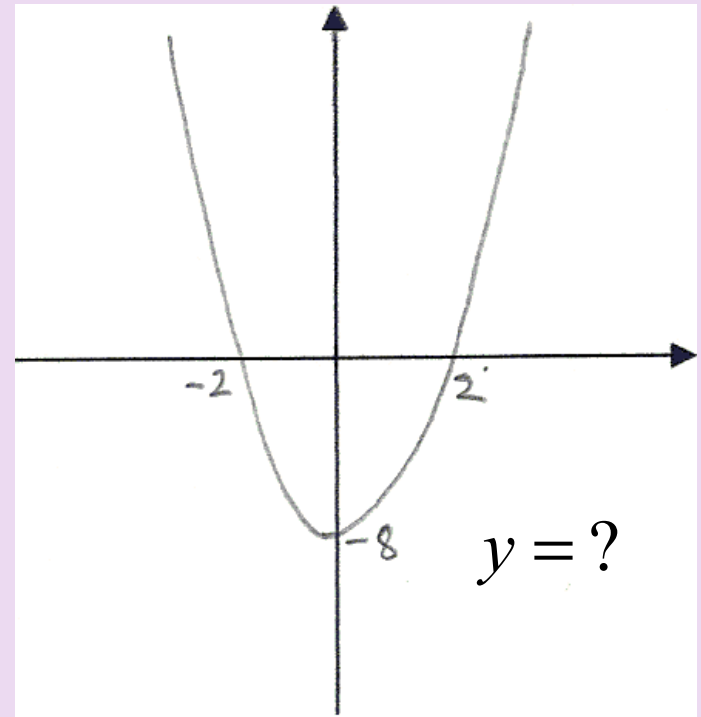
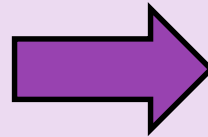
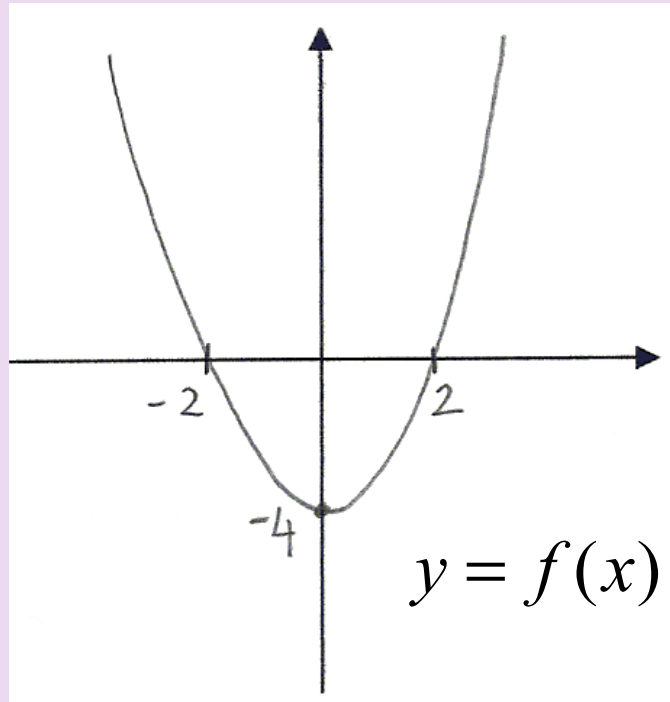
$$y = f(x) - 2$$

C

$$y = f(x + 2)$$

D

$$y = f(x - 2)$$



A

$$y = f(2x)$$

B

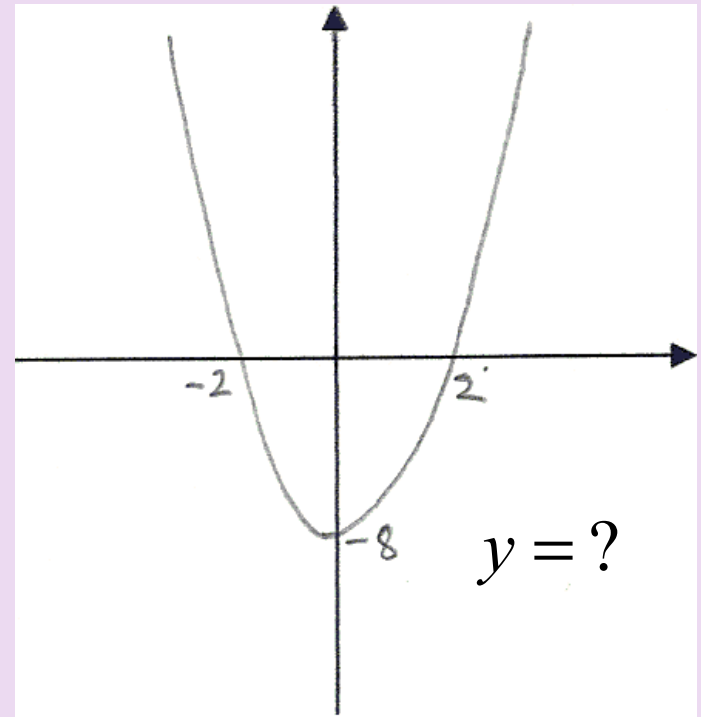
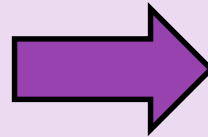
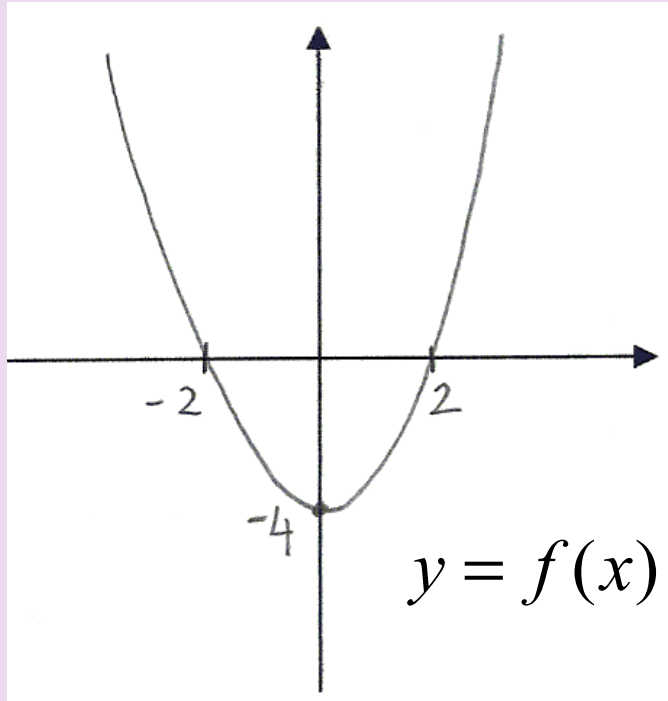
$$y = f\left(\frac{1}{2}x\right)$$

C

$$y = 2f(x)$$

D

$$y = \frac{1}{2}f(x)$$



A

$$y = f(2x)$$

B

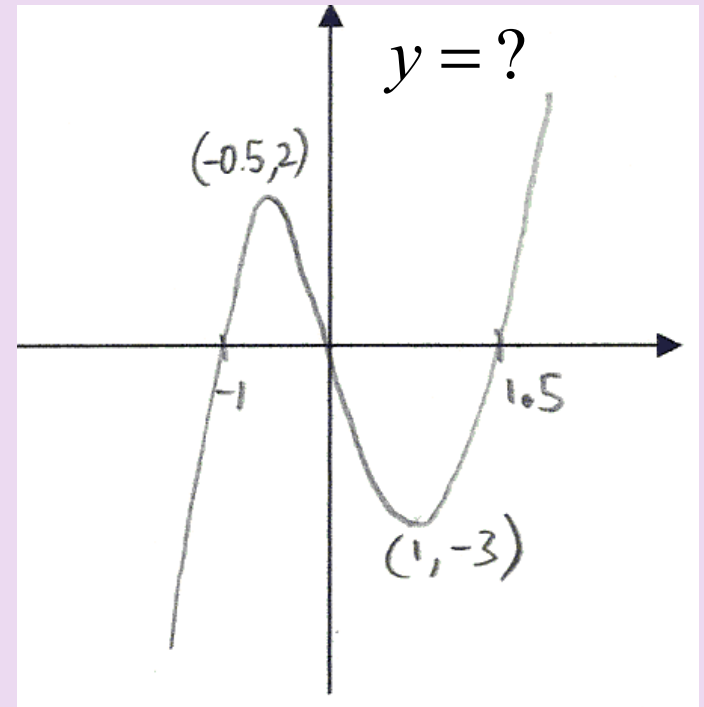
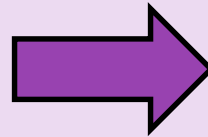
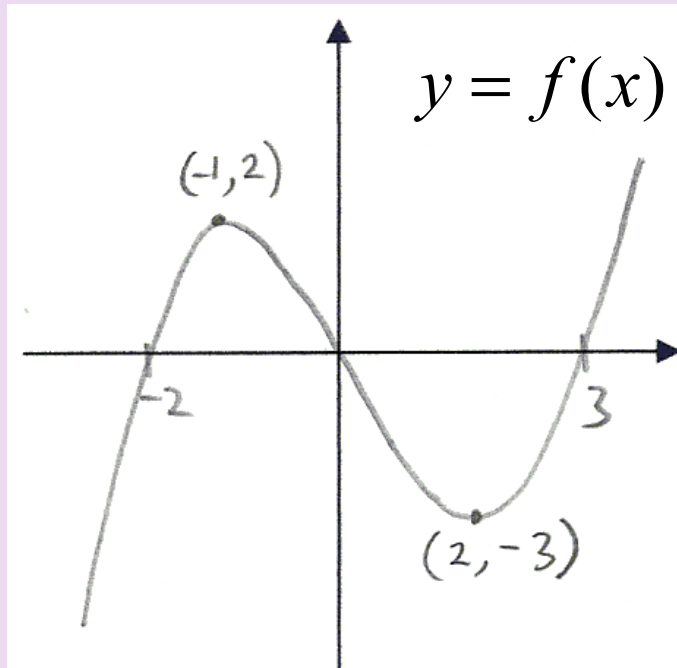
$$y = f\left(\frac{1}{2}x\right)$$

C

$$y = 2f(x)$$

D

$$y = \frac{1}{2}f(x)$$



A

$$y = f(2x)$$

B

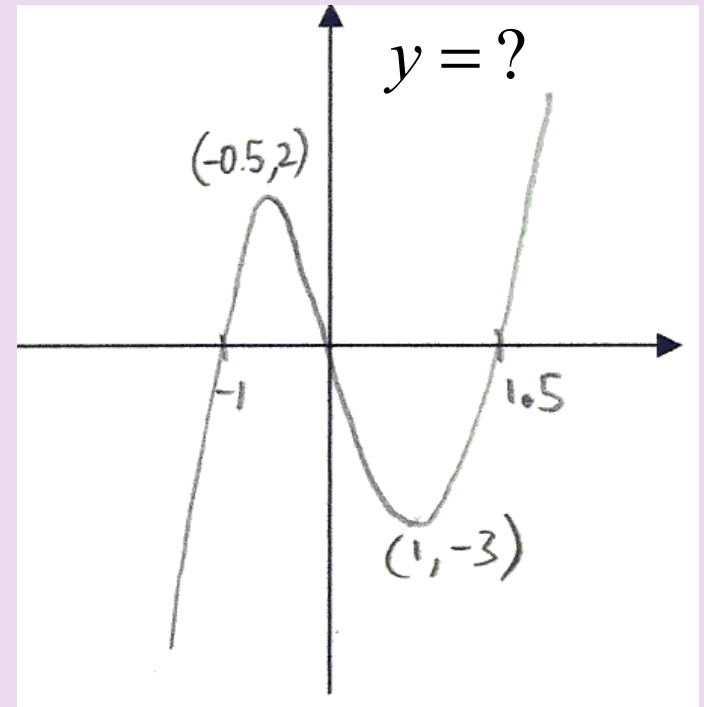
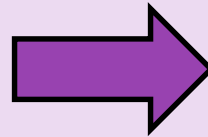
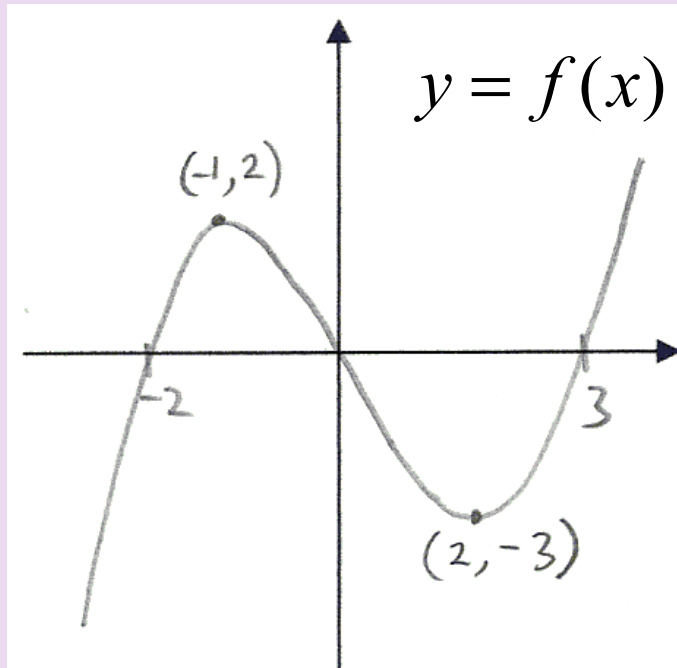
$$y = f\left(\frac{1}{2}x\right)$$

C

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D

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A

$$y = f(2x)$$

B

$$y = f\left(\frac{1}{2}x\right)$$

C

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D

$$y = \frac{1}{2}f(x)$$

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Group Activity

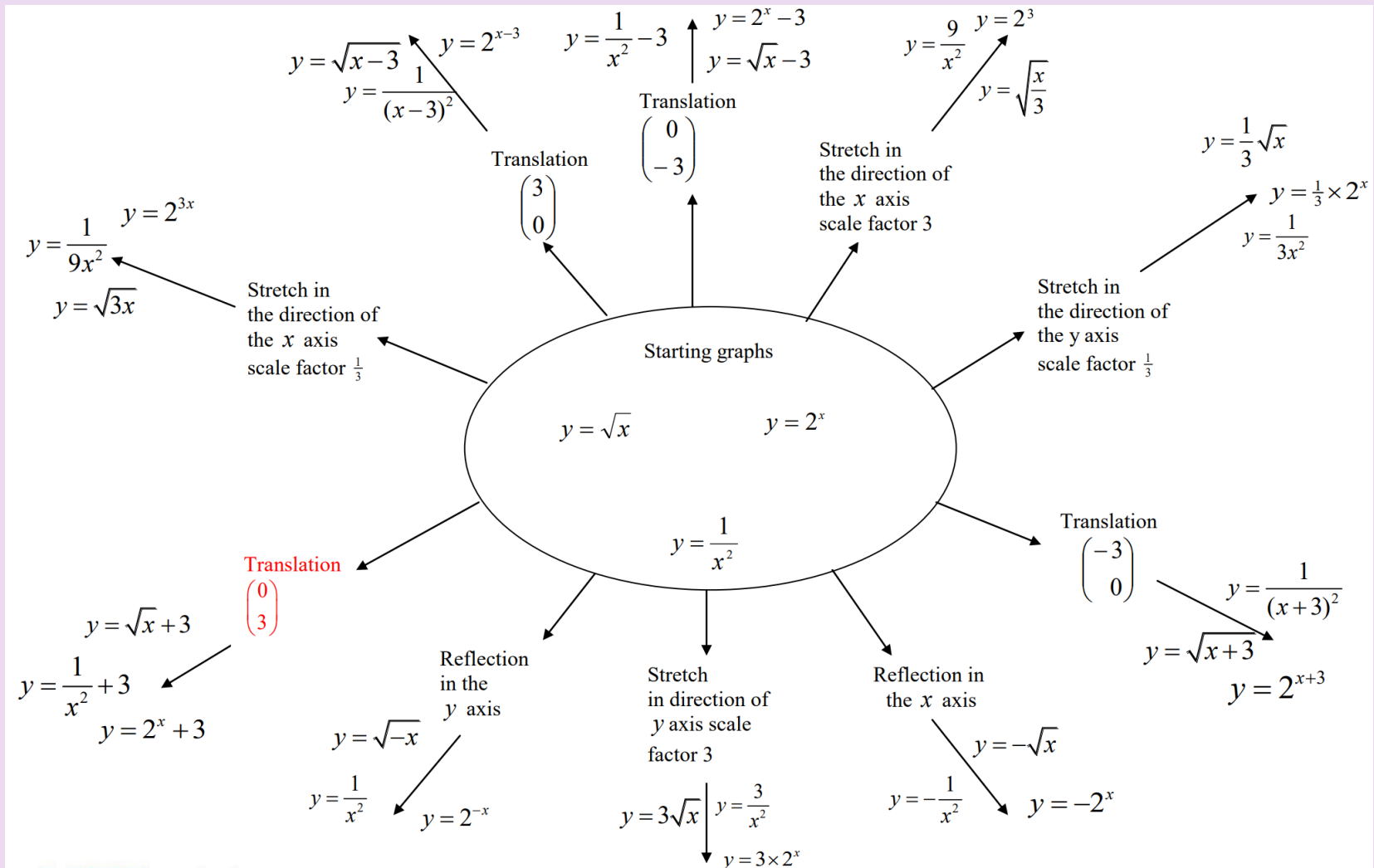
Sort the equations to represent the correct transformations.

Use graphing software (eg. Geogebra, Desmos, Autograph...) to help you if you are unsure.

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Answers



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How **confident** do you feel with this topic?

Write **red**, **amber** or **green** in your book!

Complete the corresponding activity 😊

Keywords

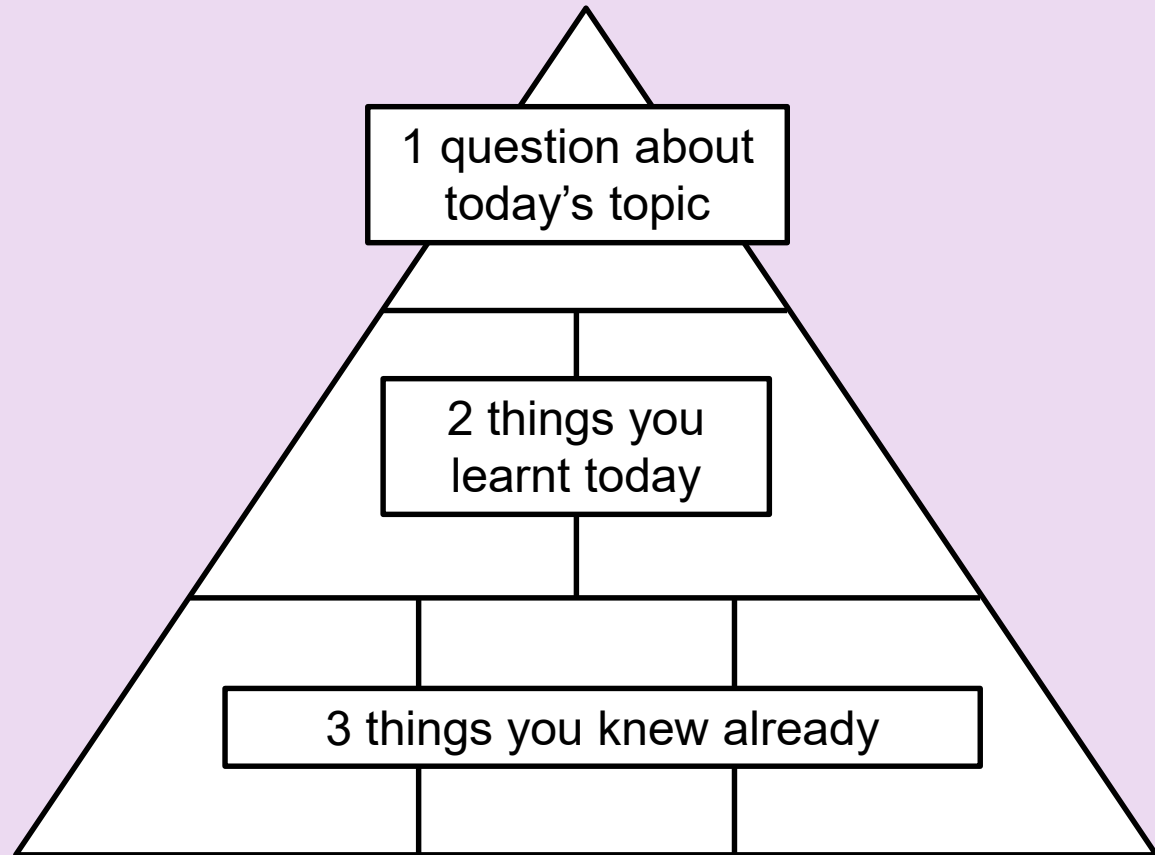
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