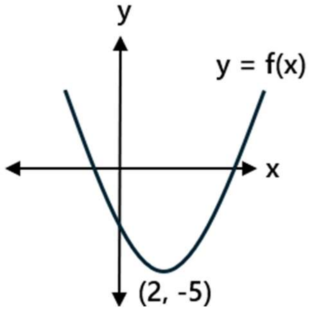
GRAPH TRANSFORMATIONS

1) The graph of $y = f(x)$ is shown below.

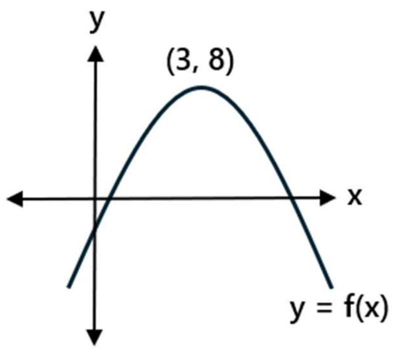
The coordinates of the minimum point on the curve are $(2, -5)$. State the coordinates of the turning point of the curve with equation:



a. $y = f(x+2)$ **$(0, -5)$**
b. $y = f(x) - 1$ **$(2, -6)$**
c. $y = -f(x)$ **$(2, 5)$**
d. $y = 2f(x)$ **$(2, -10)$**

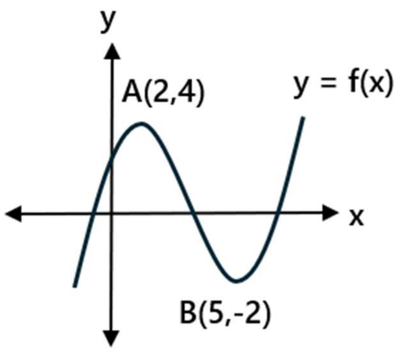
2) The graph of $y = f(x)$ is shown below.

The coordinates of the maximum point on the curve are $(3, 8)$. State the coordinates of the turning point of the curve with equation:



a. $y = f(x) + 4$ **$(3, 12)$**
b. $y = f(x) - 3$ **$(3, 5)$**
c. $y = f(3x)$ **$(1, 8)$**
d. $y = f(x-6)$ **$(9, 8)$**

3) The graph of $y = f(x)$ is shown below.



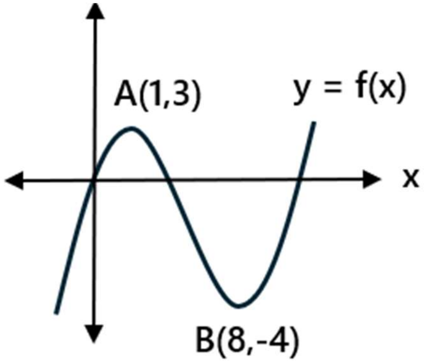
The coordinates of the maximum point on the curve are $(2, 4)$. State the coordinates of the maximum point of the curve with equation:

a. $y = -f(x)$ **$(2, -4)$**
b. $y = f(x) + 10$ **$(2, 14)$**
c. $y = f(-x)$ **$(-2, 4)$**
d. $y = f\left(\frac{1}{4}x\right)$ **$(8, 4)$**

The coordinates of the minimum point on the curve are $(5, -2)$. State the coordinates of the minimum point of the curve with equation:

e. $y = f(x+4)$ **$(1, -2)$**
f. $y = f(x-3)$ **$(8, -2)$**
g. $y = 5f(x)$ **$(5, -10)$**
h. $y = f(2x)$ **$(2.5, -2)$**

4) The graph of $y = f(x)$ is shown below.



The curve passes through the point $A(1,3)$. State the coordinates of the point A on the graph of:

a. $y = f(x) + 4$ $\mathbf{(1,7)}$

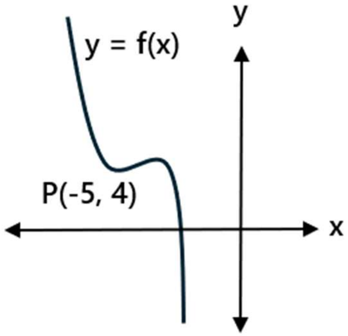
b. $y = f(x) - 3$ $\mathbf{(1,0)}$

The curve passes through the point $B(8,-4)$. State the coordinates of the point B on the graph of:

c. $y = f(4x)$ $\mathbf{(2,-4)}$

d. $y = f(x-6)$ $\mathbf{(14,-4)}$

5) A point $P(-5,4)$ is shown on the curve $y = f(x)$ below. Write down the equation that would map P to:



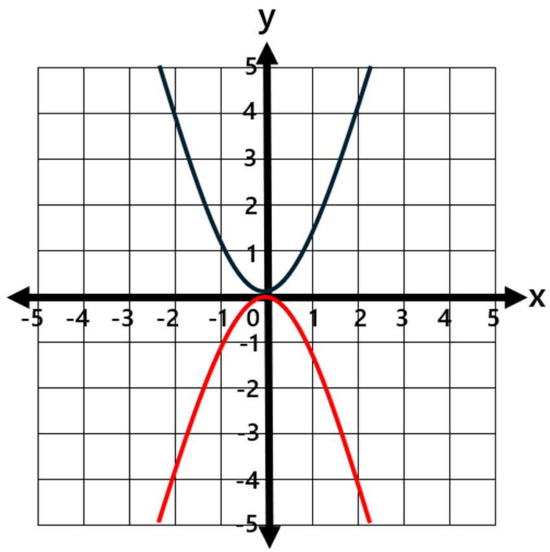
a. $(-5,-1)$ $\boldsymbol{y = f(x) - 5}$

b. $(-1,4)$ $\boldsymbol{y = f(x-4)}$

c. $(0,4)$ $\boldsymbol{y = f(x-5)}$

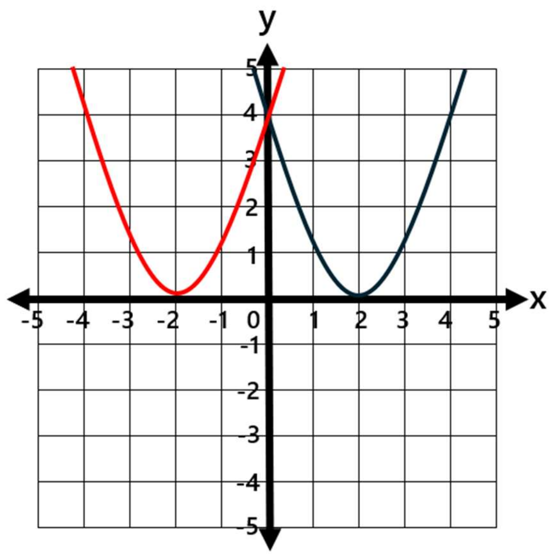
d. $(-5,8)$ $\boldsymbol{y = f(x) + 4}$

6) The graph of $y = f(x)$ is shown on the grid.



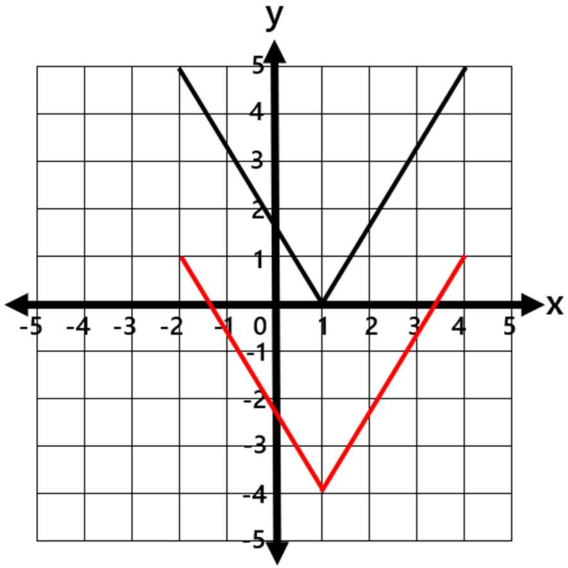
Use the grid to sketch the graph of $y = -f(x)$.

7) The graph of $y = f(x)$ is shown on the grid.



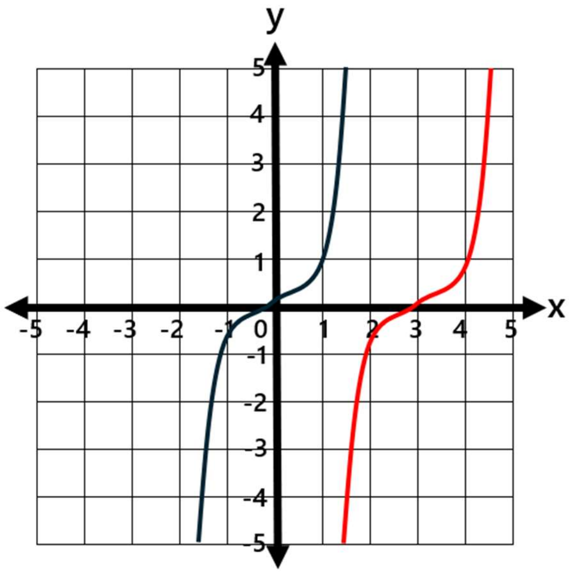
Use the grid to sketch the graph of $y = f(-x)$.

8) The graph of $y = f(x)$ is shown on the grid.



Use the grid to sketch the graph of $y = f(x) - 4$.

9) The graph of $y = f(x)$ is shown on the grid.



Use the grid to sketch the graph of $y = f(x - 3)$.

10) Describe the transformation from $y = f(x)$ to:

a. $y = f(x) + 3$
Translation by $\binom{0}{3}$ (or 3 units up).

b. $y = f(x - 5)$
Translation by $\binom{5}{0}$ (or 5 units to the right).

c. $y = -f(x)$
Reflection in the x-axis (multiply y-coordinates by -1).

d. $y = f(-x)$
Reflection in the y-axis (multiply x-coordinates by -1).

e. $y = 3f(x)$
A stretch by a scale factor of 3 in the y-direction.

f. $y = f\left(\frac{1}{3}x\right)$
A stretch by a scale factor of 3 in the x-direction.

g. $y = f(2x)$
A stretch by a scale factor of $\frac{1}{2}$ in the x-direction.

h. $y = f(x) - 7$
A translation by $\binom{0}{-7}$ (or 7 units down).

11) A student says:

$$y = f(x - 4)$$

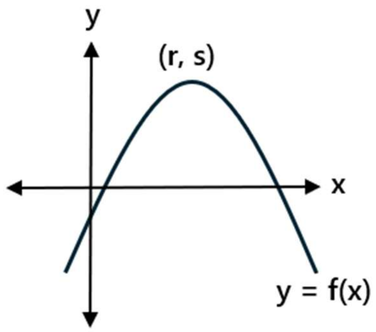
means "translate the graph 4 units left." Is the student correct? Give a reason for your answer.
No, the student is not correct. The graph should be translated 4 units to the right.

12) A point (5, 7) lies on the graph of $y = f(x)$.
Find the coordinates of the corresponding point on the graph of $y = f(x - 2) - 3$.
$(7, 4)$

13) The graph of $y = f(x)$ is translated 5 units left and reflected in the x-axis.
Write the equation of the transformed graph.
$\boldsymbol{y = -f(x+5)}$

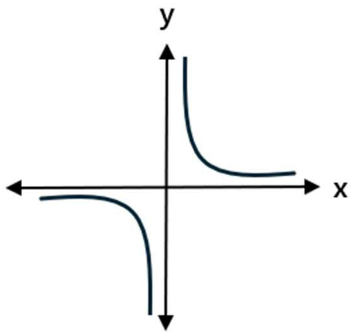
Challenge

14) The graph of $y = f(x)$ is shown below.
The maximum point on the graph is (r, s).



Write down the coordinates of the turning point of $y = f(-x) + 3$.
Give your answer in terms of r and s.
$\boldsymbol{(-r, s+3)}$

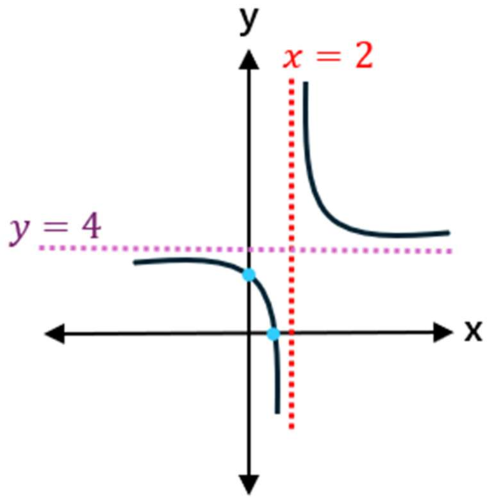
15) The graph of $y = \frac{2}{x}$ is shown below. The graph undergoes a transformation of $y = f(x-2) + 4$.
Draw a sketch of the transformed graph, labelling any new asymptotes. Then state the points of intersection with the axes.



$f(x-2) + 4 = \frac{2}{x-2} + 4$

Intersects the y-axis when x = 0:
$y = \frac{2}{0-2} + 4 = 3$
(0, 3)

Intersects the x-axis when y = 0:
$0 = \frac{2}{x-2} + 4$
$-4 = \frac{2}{x-2}$
$-4(x-2) = 2$
$-4x + 8 = 2$
$-4x = -6$
$x = \frac{3}{2}$
$\left(\frac{3}{2}, 0\right)$



Points of intersection:
$\boldsymbol{(0,3)}$ ***and*** $\boldsymbol{\left(\frac{3}{2}, 0\right)}$