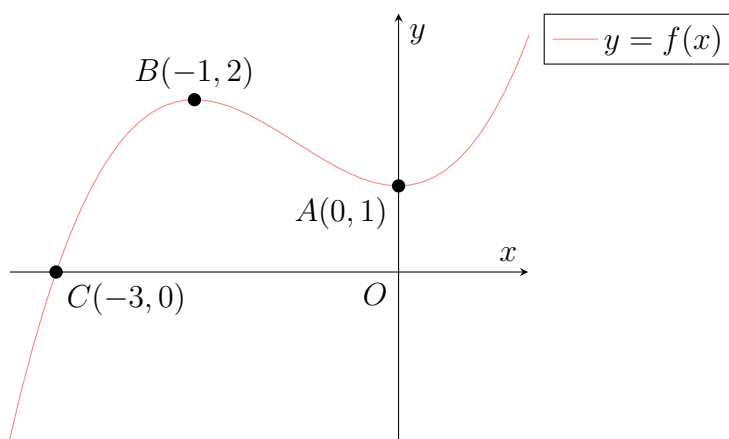
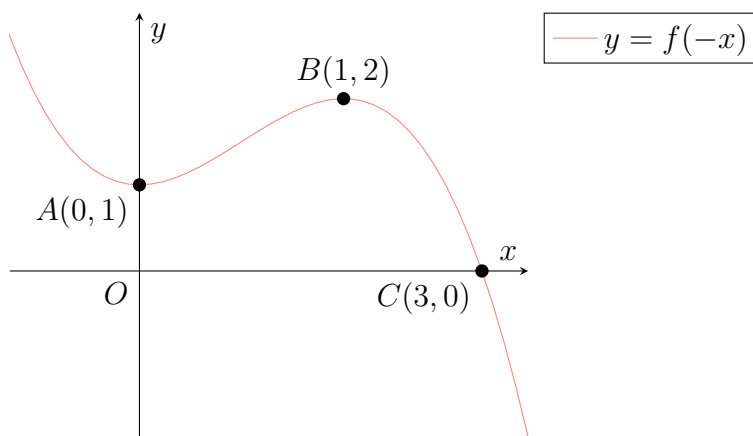


Problem 1.

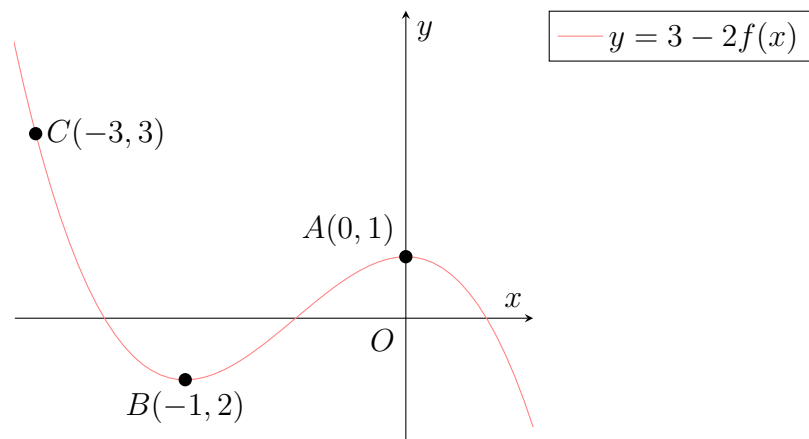
The diagram shows the graph of $y = f(x)$. The points A , B and C have coordinates $(0, 1)$, $(-1, 2)$ and $(-3, 0)$ respectively. Sketch, separately, the graphs of

- (a) $y = f(-x)$
- (b) $y = 3 - 2f(x)$
- (c) $y = 3f\left(\frac{x}{2} + 1\right)$

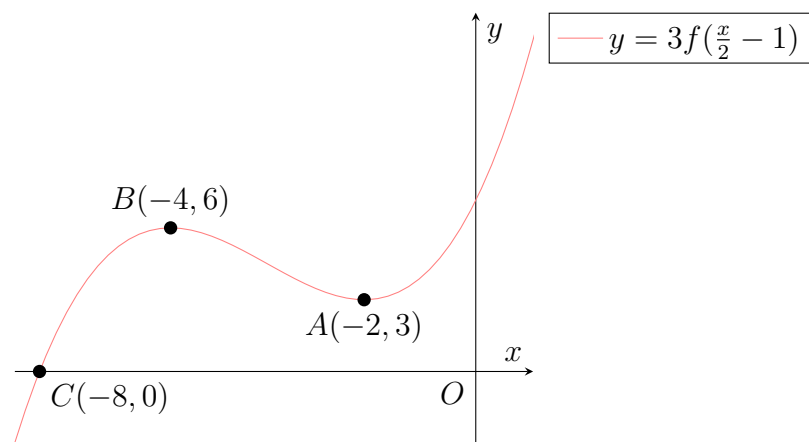
showing in each case the coordinates of the points corresponding to A , B and C .

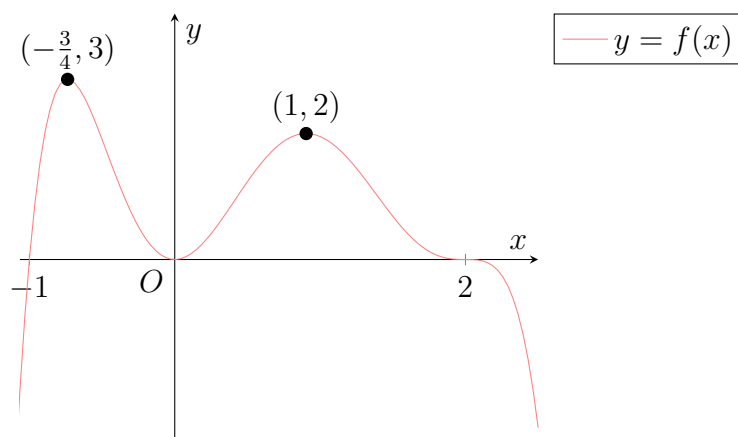
Solution**Part (a)**

Part (b)



Part (c)

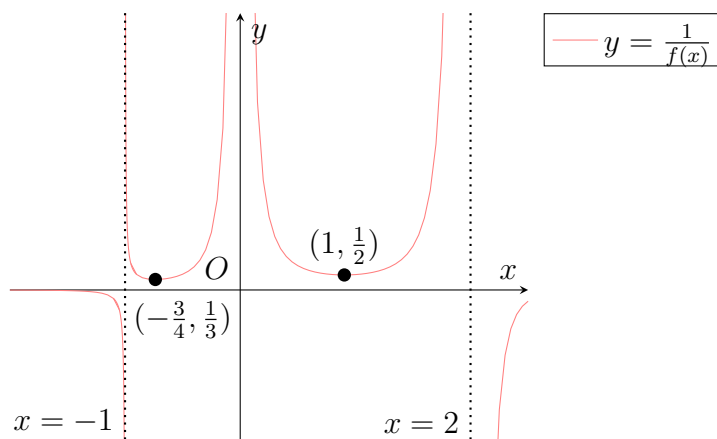


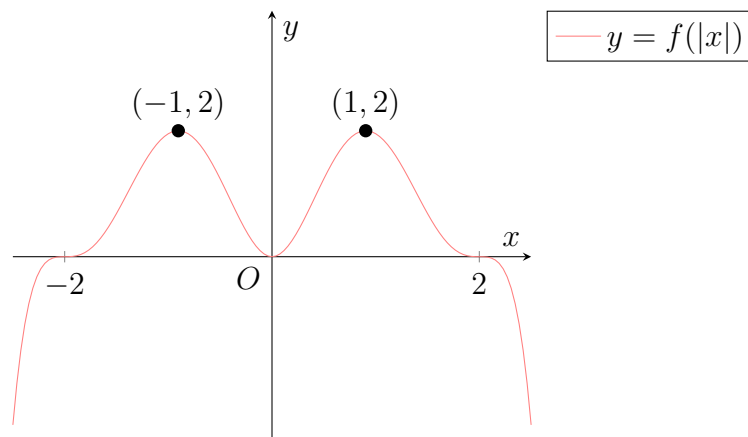
Problem 2.

The curve shown is the graph of $y = f(x)$. The x -axis is a tangent at the origin and at $(2, 0)$. The curve has two maximum points at $\left(-\frac{3}{4}, 3\right)$ and $(1, 2)$. On two separate diagrams, sketch the graphs of the following equations. Show clearly the shapes of the graphs where they meet the x -axis and any asymptotes.

(a) $y = \frac{1}{f(x)}, x \neq -1, 0, 2$

(b) $y = f(|x|)$

Solution**Part (a)**

Part (b)

Problem 3.

A graph with equation $y = f(x)$ undergoes transformation A followed by transformation B where A and B are described as follows:

- A : a translation of 1 unit in the positive direction of the x -axis
- B : a scaling parallel to the x -axis by a factor $\frac{1}{2}$

The resulting equation is $y = 4x^2 - 4x + 1$. Find the equation $y = f(x)$.

Solution

$$A: x \mapsto x - 1 \implies A^{-1}: x \mapsto x + 1$$

$$B: x \mapsto 2x \implies B^{-1}: x \mapsto \frac{1}{2}x$$

$$\begin{aligned}
 y &= 4x^2 - 4x + 1 \\
 &\quad \downarrow B^{-1} \\
 y &= 4\left(\frac{1}{2}x\right)^2 - 4\left(\frac{1}{2}x\right) + 1 \\
 &\quad \downarrow A^{-1} \\
 y &= 4\left(\frac{1}{2}(x+1)\right)^2 - 4\left(\frac{1}{2}(x+1)\right) + 1 \\
 &= 4\left(\frac{1}{2}(x+1)\right)^2 - 4\left(\frac{1}{2}(x+1)\right) + 1 \\
 \implies y &= (x+1)^2 - 2(x+1) + 1 \\
 \implies y &= x^2 + 2x + 1 - 2x - 2 + 1 \\
 \implies y &= x^2
 \end{aligned}$$

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