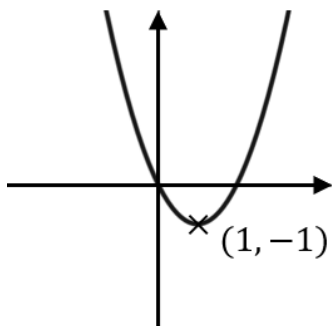


## Transformations of Points on Graphs

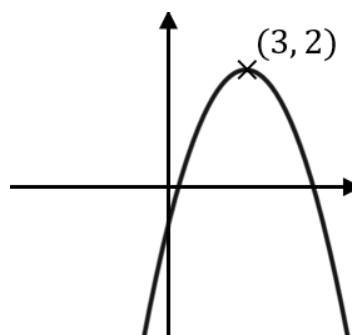
**(a)**

The curve  $y = f(x)$  shown below has a minimum point with coordinates  $(1, -1)$ .  
Write down the coordinates of the minimum point of the curve  $y = f(x) + 3$



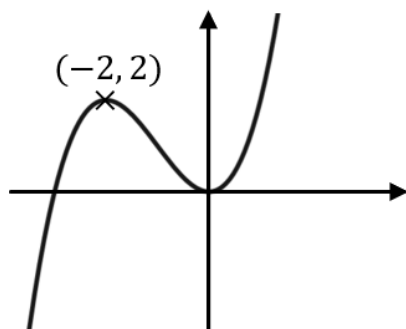
**(b)**

The point  $P(3, 2)$  lies on the curve with equation  $y = f(x)$  shown below. Write down the coordinates of the point  $P$  on the transformed curve  $y = -f(x)$



**(c)**

The curve  $y = f(x)$  shown below has a maximum point with coordinates  $(-2, 2)$ .



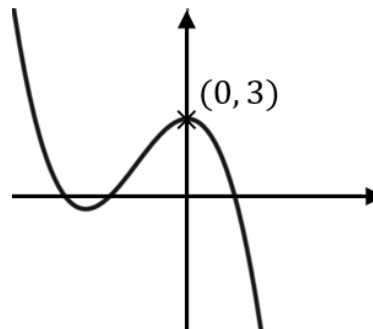
Write down the coordinates of the maximum point of the transformed curve

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

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

**(d)**

The curve  $y = f(x)$  shown below has a maximum point with coordinates  $(0, 3)$ .



Write down the coordinates of the maximum point of the transformed curve

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

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

**(e)**

The curve  $A$  with equation  $y = f(x)$  is transformed to give the curve  $B$  with equation  $y = f(-x) + 2$ . The point  $(1, 1)$  lies on the curve  $A$ . What point does this map to on the transformed curve  $B$ ?

**(f)**

The curve  $C$  with equation  $y = f(x)$  is transformed to give the curve  $D$  with equation  $y = -f(x + 1) - 2$ . The point  $(3, -2)$  lies on the curve  $C$ . What point does this map to on the transformed curve  $D$ ?