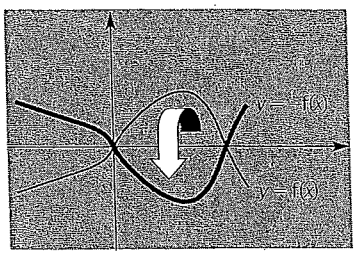
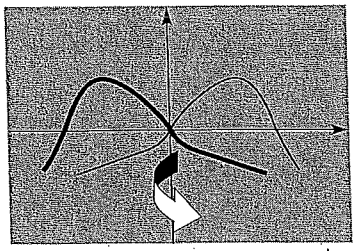
Transformations of curves

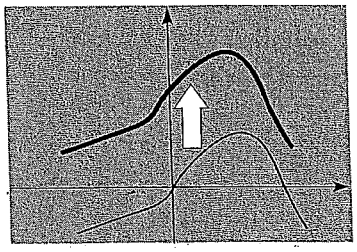
The curve $y = -f(x)$ is the reflection in the x-axis of the curve $y = f(x)$.



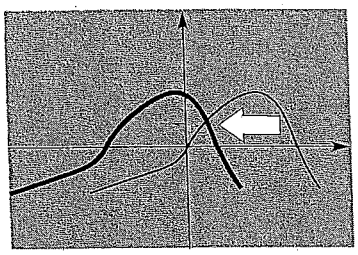
The curve $y = f(-x)$ is the reflection in the y-axis of the curve $y = f(x)$.



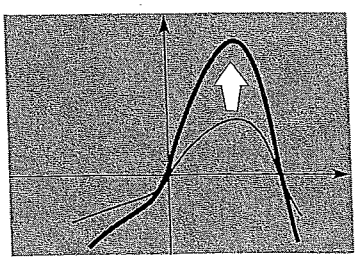
The curve $y = f(x) + a$ is the translation of the curve $y = f(x)$ by a units up the y-axis. If a is negative the curve moves down.



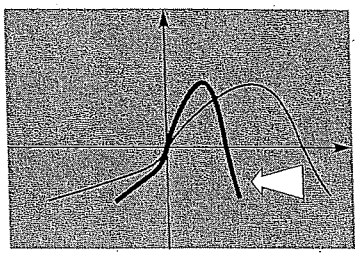
The curve $y = f(x + a)$ is the translation of the curve $y = f(x)$ by a units back along the x-axis. If a is negative, the curve moves forward along the x-axis.



The curve $y = af(x)$ is a one-way stretch of the curve $y = f(x)$ by a units parallel to the y-axis. When $a < 1$, the curve shrinks parallel to the y-axis.



The curve $y = f(ax)$ is a one-way reduction of the curve $y = f(x)$ by a units parallel to the x-axis. When $a < 1$, the curve expands parallel to the x-axis.

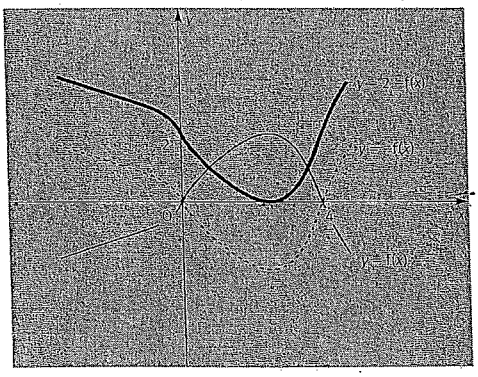


Compound transformations

To sketch a compound transformation of a curve $y = f(x)$, start with a sketch of $y = f(x)$, then identify the order of the transformations and apply them to the given curve in that order,

e.g. to sketch the curve $y = 2 - f(x)$

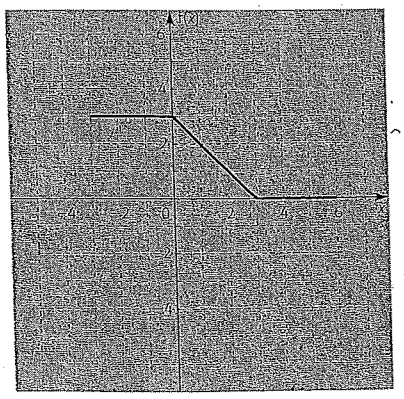
you need to recognise that $y = 2 - f(x)$ is the compound transformation 'reflect $y = f(x)$ in the x-axis then translate it two units up the y-axis'. Start by sketching $y = f(x)$, reflect it in the x-axis to give $y = -f(x)$, then lift this 2 units.



Question

The diagram shows a sketch of $y = f(x)$.
Sketch the curve

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



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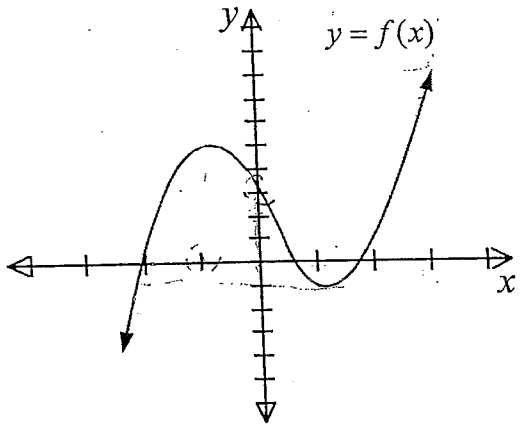
Exercise 8: Transformation Of Graphs

Q2 The graph of $y=f(x)$ is drawn below. By drawing a quick sketch in each case, match up the following equations with their corresponding graphs.



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

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

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

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

(v) $y=f(x+2)-3$

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

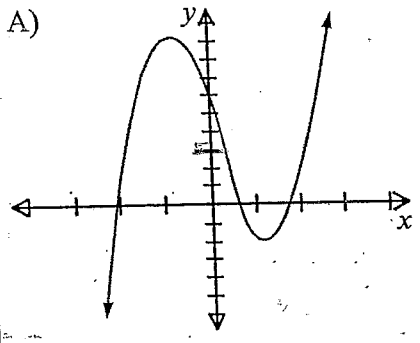
(vii) $y=2f(x)$

(viii) $y=\frac{1}{3}f(x)$

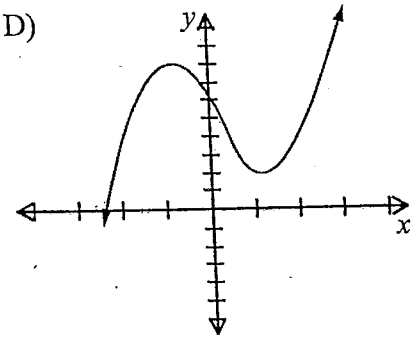
(ix) $y=-f(x)$

ANSWERS

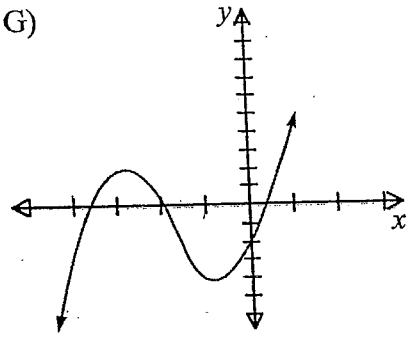
A)



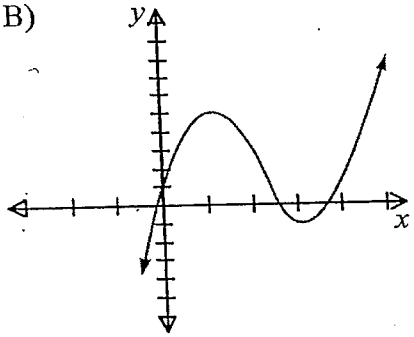
D)



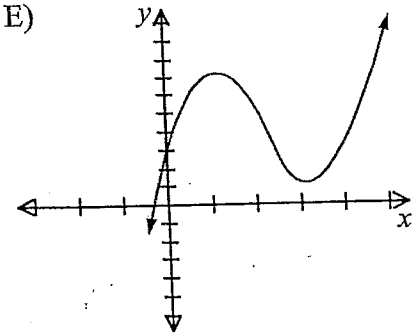
G)



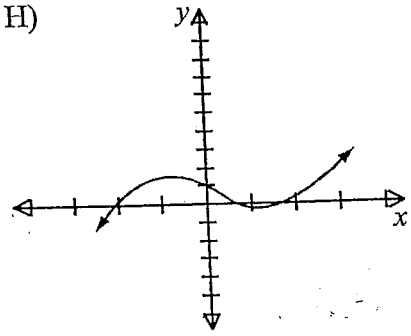
B)



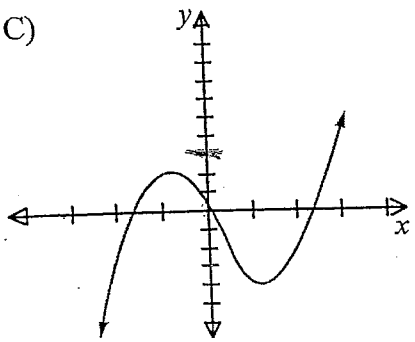
E)



H)



C)



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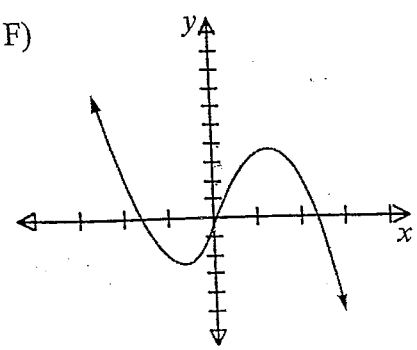
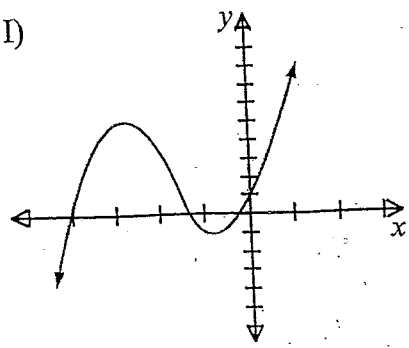


I)



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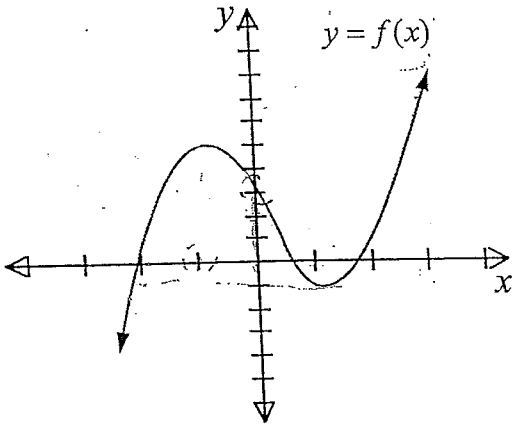


(i) $y = f(x) + 3$

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

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

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

(v) $y = f(x + 2) - 3$

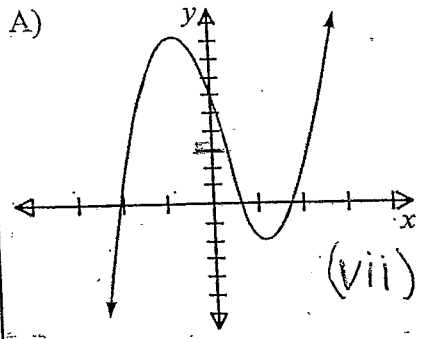
(vi) $y = f(x - 2) + 2$

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

(viii) $y = \frac{1}{3}f(x)$

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

ANSWERS

A)


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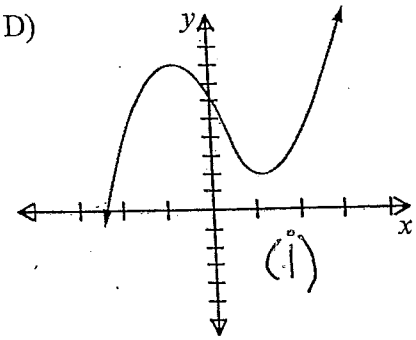

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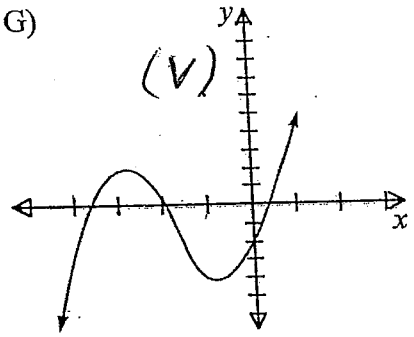
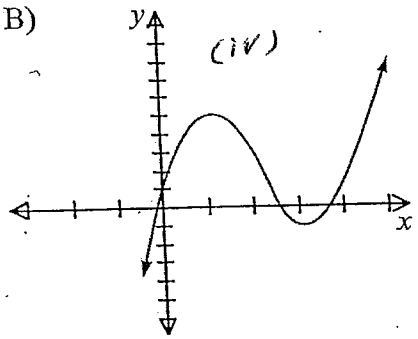


B)


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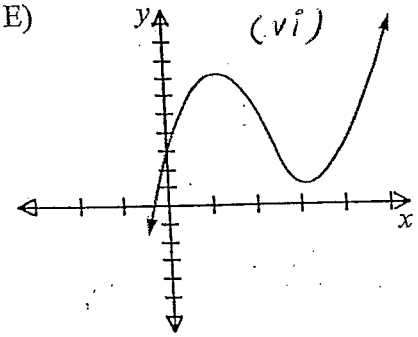

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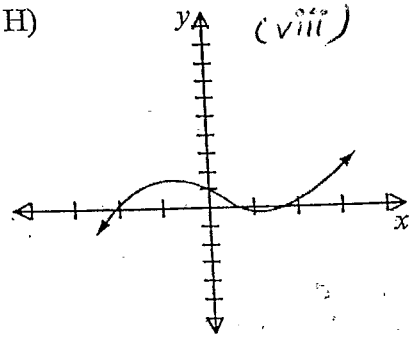

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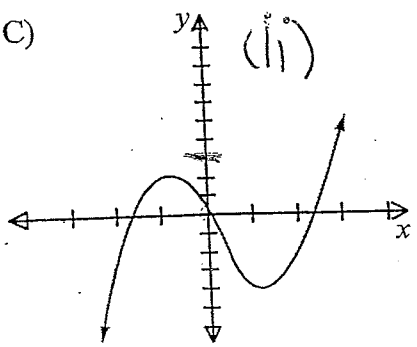

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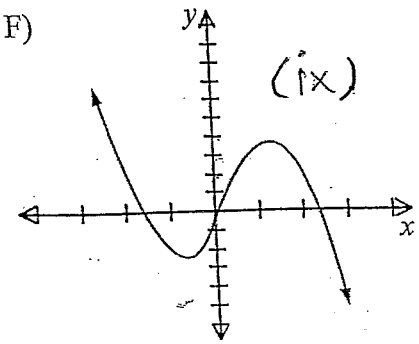
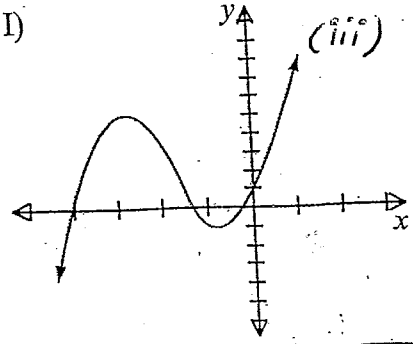
I)