

# Graph Transformations – Question Set

## Describing Transformations

- Q1** State the sequence of transformations that maps  $y = \sqrt{x}$  onto  $y = -\sqrt{x+5} - 2$ .
- Q2** Describe the transformation from  $y = x^2$  to  $y = 4(x-2)^2$ .
- Q3** (a) Write the shift for  $y = \frac{1}{x-6} + 3$  (b) Write the reflection for  $y = -|x|$
- Q4** Identify the amplitude, period and vertical shift of  $y = 3\sin(2x) - 1$ .
- Q5** Does  $y = (x+4)^3 - 7$  involve a vertical stretch? Explain.

## Writing Equations from Graph Features

- Q6** Give an equation for a cubic that passes through the origin, is reflected in the  $x$ -axis, and stretched vertically by  $k = 2$ .
- Q7** The graph of  $y = \frac{1}{x}$  is translated 3 units left and 5 units up. Write the new equation.
- Q8** A parabola opens downward, has vertex  $(1, 4)$  and  $y$ -intercept 8. Find its equation in vertex form.
- Q9** A circle of radius 4 is centred at  $(-5, 2)$ . Write its equation.

## Sketching & Intercepts

- Q10** Sketch  $y = |x-3| - 2$ , clearly labelling vertex and intercepts.
- Q11** Sketch  $y = -2\sqrt{x}$  for  $x \geq 0$  and state its domain and range.
- Q12** Draw one period of  $y = \cos\left(\frac{\pi}{3}x\right) + 1$ , marking turning points.

## Composite Transformations

- Q13** Apply the following to  $y = x^2$  in order: (i) stretch vertically by 3, (ii) translate down 5, (iii) reflect in the  $y$ -axis. Write the final equation.
- Q14** Show that performing a horizontal stretch  $x \mapsto 2x$  *after* a right shift of 3 on  $y = \sqrt{x}$  produces a different graph than reversing the order.

## Piecewise & Step Functions

- Q15** Define a piecewise function that equals  $2x + 1$  for  $x < -1$ , 0 for  $-1 \leq x < 3$ , and  $x - 4$  for  $x \geq 3$ .
- Q16** Sketch the greatest-integer (step) function  $y = \lfloor x - 1.2 \rfloor$  for  $-1 \leq x \leq 4$ .

## Inverse Transformations

- Q17** If  $f(x) = 3x - 4$ , state the graph transformation required to obtain  $y = f^{-1}(x)$ .
- Q18** Explain why the inverse of  $y = (x - 2)^2 + 5$  is *not* a function unless the domain is restricted.

## Mixed Practice

- Q19** (a) Find the image of the point  $(2, -3)$  after reflecting  $y = |x|$  in the  $x$ -axis (b) Find the pre-image of  $(-1, 5)$  for  $y = |x|$
- Q20** A rational function has vertical asymptote  $x = 4$ , horizontal asymptote  $y = -2$  and passes through  $(5, -1)$ . Determine its equation in the form  $y = \frac{k}{x - 4} - 2$ .
- Q21** A sine curve of amplitude 4 is shifted up 3 and has period  $120^\circ$ . Write its equation if one maximum occurs at  $(15^\circ, 7)$ .
- Q22** State the transformations that map  $y = \tan x$  onto  $y = -\tan(2x) + 1$ .

## Challenge Question – Order Matters

- Q23** Starting with the basic hyperbola  $y = \frac{1}{x}$ :
- (a) First translate the graph 6 units to the right, *then* reflect it in the  $y$ -axis. Write an explicit equation for the resulting curve.
- (b) Now perform the *same two* transformations in the reverse order (*reflect in the  $y$ -axis first, then translate*