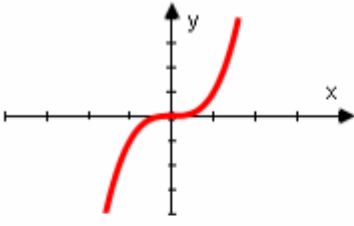


Transformation Of Functions Exam Questions MS (From OCR Legacy 4721)

Q1 (Jan 2005, Q3)

3(i)	$y = 5\sqrt{2x}$	M1	$\sqrt{2x}$ or $\sqrt{\frac{x}{2}}$ seen
		A1 2	$y = 5\sqrt{2x}$
(ii)	Translation $\begin{pmatrix} 0 \\ -3 \end{pmatrix}$	B1	Translation
		B1 2	$\begin{pmatrix} 0 \\ -3 \end{pmatrix}$ o.e.
		4	

Q2 (Jun 2005, Q3)

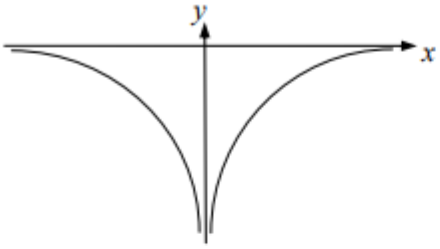
3 (i)		B1 1	Correct sketch showing point of inflection at origin
(ii)	Reflection in x-axis or reflection in y-axis	B1 B1 2	Reflection In x-axis or $y=0$ or y-axis or $x=0$
(iii)	$y = (x - p)^3$	M1	$y = (x \pm p)^3$
		A1 2	$y = (x - p)^3$
		5	

Q3 (Jan 2007, Q5)

5 (i)		M1	Reflection in either axis
		A1 2	Correct reflection in x axis
(ii)	(1, 3)	B1 B1 2	Correct x coordinate Correct y coordinate
		SR	B1 for (3, 1)
(iii)	Translation 2 units in negative x direction	B1 B1 2	
		6	

Q4 (Jun 2010, Q2)

(i)

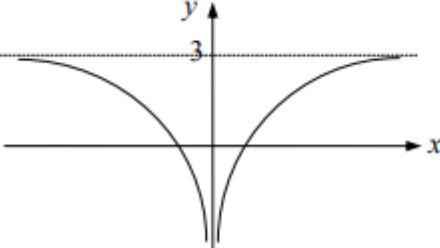


B1* Reasonably correct curve for $y = -\frac{1}{x^2}$ in 3rd and 4th quadrants only

B1 dep* 2 Very good curves in curve for $y = -\frac{1}{x^2}$ in 3rd and 4th quadrants

SC If 0, very good single curve in either 3rd or 4th quadrant and nothing in other three quadrants. **B1**

(ii)



M1 Translation of their $y = -\frac{1}{x^2}$ vertically

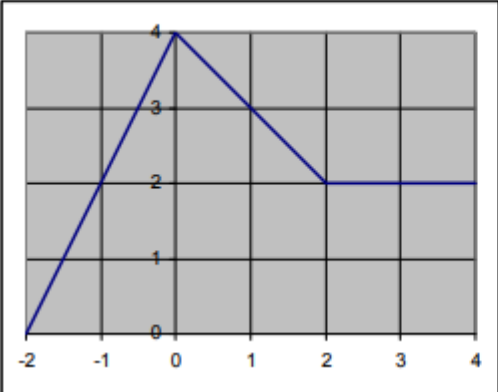
A1 2 Reasonably correct curve, horizontal asymptote so i at $y = 3$

(iii) $y = -\frac{2}{x^2}$ **B1** 1

5

Q5 (Jan 2010, Q2)

(i)



B1 For $x < 0$, straight line joining $(-2, 0)$ and $(0, 4)$

B1 2 For $x > 0$, line joining $(0,4)$ to $(2, 2)$ and horizontal line joining $(2,2)$ and $(4,2)$

(ii) Translation
1 unit right parallel to x axis **B1** 2

B1 Allow:
1 unit right,
1 along the x axis,
1 in x **direction**,
allow vector notation e.g. $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$,
1 unit horizontally

4


Q6, (Jan 2013, Q3)

(i)		<p>B1 -ve cubic with 3 distinct roots</p> <p>B1 (0, 6) labelled or indicated on y-axis – seen elsewhere not enough</p> <p>B1 (-3, 0), (-1, 0) and (2, 0) labelled or indicated on x-axis and no other x-intercepts.</p> <p>[3]</p>	<p>Must not stop at x-axis. Condone errors in curvature at the extremes unless extra turning point(s)/root(s) clearly implied.</p> <p>Must have a curve for 2nd and 3rd marks</p> <p>Do not allow final B1 if shown as repeated root(s)</p>
(ii)	Reflection in the y axis	<p>B1 Not mirrored/flipped etc. or $x = 0$. No/through/along etc. Must be “in”. Cannot get 2nd B1 without some indication of a reflection e.g. flip etc. Do not ISW if contradictory statement seen</p> <p>[2]</p>	<p>Alt Stretch (scale) factor -1 B1 parallel to the x axis for B1</p> <p>Must be a single transformation for any marks</p>

Q7 (Jun 2013, Q5)

(i)		<p>B1</p> <p>B1</p> <p>[2]</p>	<p>Excellent curve for $y = \frac{2}{x^2}$ in either quadrant</p> <p>Excellent curve for $y = \frac{2}{x^2}$ in other quadrant and no more.</p> <p>SC B1 Reasonably correct curves in 1st and 2nd quadrants and no more</p>
(ii)	$y = \frac{2}{(x+5)^2}$	<p>M1</p> <p>A1</p> <p>[2]</p>	<p>$\frac{2}{(x+5)^2}$ or $\frac{2}{(x-5)^2}$ seen</p> <p>Fully correct, must include “y =” or “f(x) =”</p>
(iii)	<p>Stretch</p> <p>scale factor $\frac{1}{2}$ parallel to y-axis</p>	<p>B1</p> <p>B1</p> <p>[2]</p>	<p>Or “stretched” etc; do not accept squashed, compressed etc.</p> <p>oe e.g. scale factor $\frac{1}{\sqrt{2}}$ parallel to x-axis</p>

Q8 (OCR 4722, Jun 2016, Q8) [Modified]

(i)	2 (units) in the positive x -direction	M1	Correct direction	<p>Identify that the translation is in the x-direction (either positive or negative, so M1 for eg '2 in negative x-direction')</p> <p>Allow any terminology as long as intention is clear, such as in/on/along the x-axis</p> <p>Ignore the magnitude</p>
		A1	Fully correct description	<p>Must have correct magnitude and correct direction, using precise language - such as 'in the x-direction', 'parallel to the x-axis', 'horizontally' or 'to the right'</p> <p>A0 for in/on/along the x-axis etc</p> <p>Allow M1A1 for '2 in the x-direction' as positive is implied</p> <p>A0 for 'factor 2'</p> <p>'Units' is not required, but A0 for 'places', 'spaces', 'squares' etc</p> <p>Allow in vector notation as well, so M1 for $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$ and M1A1 for $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$</p>
(ii)	sf $\frac{2}{9}$ in the y -direction	M1	Correct direction, with sf of $\frac{2}{9}$ or 9	<p>Identify that the stretch is in the y-direction, with a scale factor of either $\frac{2}{9}$ or 9 (or equiv in index notation)</p> <p>Allow just $\frac{2}{9}$ or 9, with no mention of 'scale factor'</p> <p>Allow exact decimal equiv for $\frac{2}{9}$</p> <p>Allow any terminology as long as the intention is clear, such as in/on/along the y-axis</p>
		A1	Fully correct description	<p>Must have correct scale factor and correct direction, using precise language - such as 'in the y-direction', 'parallel to the y-axis' or 'vertically'</p> <p>A0 for in/on/along the y-axis etc</p> <p>Must now have 'scale factor' or 'factor'</p> <p>Allow 'positive y-direction' (not incorrect as graph is wholly above x-axis)</p>
		[2]		
(iii)	 <p>intersect at $(0, \frac{2}{9})$</p>	B1*	Correct sketch, in both quadrants	<p>Curve must tend towards the negative x-axis, but not touch or cross it, nor a significant flick back upwards</p> <p>If from plotted points then there must be enough of the graph shown to demonstrate the correct general shape, including the negative x-axis being an asymptote</p> <p>Ignore any numerical values given</p>
		B1d*	State $(0, \frac{2}{9})$	<p>Condone $x = 0, y = \frac{2}{9}$ as an alternative, but $x = 0$ must be stated explicitly rather than implied</p> <p>Allow no brackets around the coordinates</p> <p>Allow exact decimal equiv for $\frac{2}{9}$</p> <p>Allow just $\frac{2}{9}$ as long as marked on the y-axis</p> <p>Allow BOD for $(\frac{2}{9}, 0)$ on y-axis, but not if just stated</p> <p>Just being seen in a table of values is not sufficient</p> <p>Ignore any other labelled coordinates</p>
		[2]		