



Multiple Transformations Of Functions Exam Questions (From OCR 4723)

Q1, (Jun 2005, Q9i [Modified])

The function f is defined by $f(x) = \sqrt{(mx + 7)} - 4$, where $x \geq -\frac{7}{m}$ and m is a positive constant.

- (i) A sequence of transformations maps the curve $y = \sqrt{x}$ to the curve $y = f(x)$. Give details of these transformations. [4]

Q2, (Jun 2009, Q8i)

Give details of the pair of transformations which transforms the curve $y = \ln x$ to the curve $y = 2 \ln(x - 6)$. [3]

Q3, (Jan 2007, Q7i,ii)

The curve $y = \ln x$ is transformed to the curve $y = \ln\left(\frac{1}{2}x - a\right)$ by means of a translation followed by a stretch. It is given that a is a positive constant.

- (i) Give full details of the translation and stretch involved. [2]

- (ii) Sketch the graph of $y = \ln\left(\frac{1}{2}x - a\right)$. [2]

Q4, (Jan 2008, Q6i)

Give details of the pair of geometrical transformations which transforms the graph of $y = -\sin^{-1}(x - 1)$ to the graph of $y = \sin^{-1} x$. [3]

Q5, (Jan 2010, Q8i)

The curve $y = \sqrt{x}$ can be transformed to the curve $y = \sqrt{2x + 3}$ by means of a stretch parallel to the y -axis followed by a translation. State the scale factor of the stretch and give details of the translation. [3]

Q6, (Jun 2010, Q2)

The transformations R, S and T are defined as follows.

- R : reflection in the x -axis
S : stretch in the x -direction with scale factor 3
T : translation in the positive x -direction by 4 units

- (i) The curve $y = \ln x$ is transformed by R followed by T. Find the equation of the resulting curve. [2]

- (ii) Find, in terms of S and T, a sequence of transformations that transforms the curve $y = x^3$ to the curve $y = \left(\frac{1}{9}x - 4\right)^3$. You should make clear the order of the transformations. [2]



Q7, (Jun 2011, Q2)

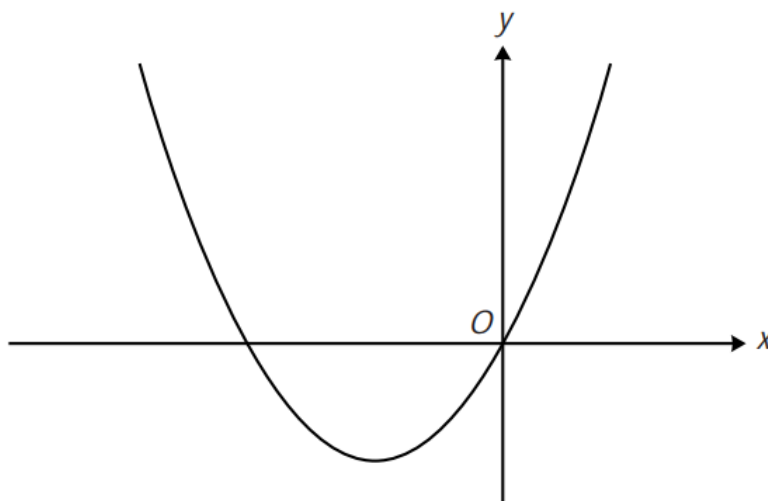
The curve $y = \ln x$ is transformed by:

- a reflection in the x -axis,
- followed by a stretch with scale factor 3 parallel to the y -axis,
- followed by a translation in the positive y -direction by $\ln 4$.

Find the equation of the resulting curve, giving your answer in the form $y = \ln(f(x))$.

[4]

Q8, (Jan 2012, Q9)



The function f is defined for all real values of x by

$$f(x) = k(x^2 + 4x),$$

where k is a positive constant. The diagram shows the curve with equation $y = f(x)$.

- (i) The curve $y = x^2$ can be transformed to the curve $y = f(x)$ by the following sequence of transformations:
- a translation parallel to the x -axis,
 - a translation parallel to the y -axis,
 - a stretch.

Give details, in terms of k where appropriate, of these transformations.

[5]

Q9, (Jun 2006, Q8i,ii) [Note: Requires knowledge of the form $R\cos(\theta - \alpha)$]

- (i) Express $5 \cos x + 12 \sin x$ in the form $R \cos(x - \alpha)$, where $R > 0$ and $0^\circ < \alpha < 90^\circ$. [3]
- (ii) Hence give details of a pair of transformations which transforms the curve $y = \cos x$ to the curve $y = 5 \cos x + 12 \sin x$. [3]

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Q10, (Jan 2009, Q7) [Note: Parts i/ii require knowledge of the modulus function]

The diagram shows the curve $y = e^{kx} - a$, where k and a are constants.

- (i) Give details of the pair of transformations which transforms the curve $y = e^x$ to the curve $y = e^{kx} - a$. [3]
- (ii) Sketch the curve $y = |e^{kx} - a|$. [2]
- (iii) Given that the curve $y = |e^{kx} - a|$ passes through the points $(0, 13)$ and $(\ln 3, 13)$, find the values of k and a . [4]
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