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VCE Specialist Mathematics ½
Transformations II [4.3]
Homework

Admin Info & Homework Outline:

Student Name	
Questions You Need Help For	
Compulsory Questions	Pg 02 - Pg 13
Supplementary Questions	Pg 14 - Pg 23

Section A: Compulsory Questions

Sub-Section [4.3.1]: Transformations of Graphs

Question 1

a. State the transformation matrix for dilation by factor 2 from the x-axis, followed by a reflection in the y-axis.

b. Find the image of the point (x, y) under this transformation.

c. Consider the graph $f(x) = (x-3)^2 - 1$. All points of the graph have been transformed by the matrix in **part a.** Write the equation of the transformed graph.

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Question 2

a. State the transformation matrix for dilation by factor 3 from the y-axis, followed by a reflection in the x-axis, and then a shear in the x-direction with shear factor 1.

b. Find the image of the point (x, y) under this transformation.

c. Consider the graph $f(x) = 6x + 7$. All points of the graph have been transformed by the matrix in **part a.** Write an equation for the transformed graph.

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Question 3

a. State the transformation matrix for a dilation by factor $\frac{1}{2}$ from the x-axis, followed by a rotation of $\frac{\pi}{2}$ clockwise.

b. Find the image of (x, y) under this transformation.

c. Consider the graph $f(x) = x^2 + 2x$. All points have been transformed by the matrix in **part a.** Write the equation of the transformed graph.

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Question 4 Tech-Active.

Find the equation of the line $y = 2x - 3$ under the transformation matrix $T = \begin{bmatrix} 3 & -1 \\ 2 & 1 \end{bmatrix}$.

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Sub-Section [4.3.2]: Rotations Around Points

Question 5

a. A point $P = (3, 1)$ is rotated $90°$ anticlockwise about the origin. Find the coordinates of the image point.

b. The graph of $f(x) = x^2$ is rotated $180°$ about the origin. Write the equation of the transformed graph.

Question 6

a. A triangle has vertices $A(2, 0), B(2, 3), C(4, 0)$. The triangle is rotated $90°$ clockwise about the origin. Find the coordinates of the new vertices.

b. The graph of $f(x) = \sqrt{x}$ is rotated 270° anticlockwise about the origin. Write the equation of the transformed graph.

Question 7

a. A point A $(6, 2)$ is rotated 90° anticlockwise about the point $(3, 1)$. Find the image of point A.

b. The graph of $f(x) = \frac{1}{x-1}$ is rotated 90° clockwise about the point $(1, 0)$. Write the equation of the transformed graph.

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Question 8 Tech-Active.

A point $(3, -2)$ is rotated $135°$ anticlockwise about the origin. Find the image of the point.

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Sub-Section [4.3.3]: Reflections in Lines

Question 9

a. Reflect the point $(3, 5)$ in the line $y = x$.

b. Reflect the point $(-2, 4)$ in the line $y = -x$.

Question 10

a. Reflect the point $(4, 0)$ in the line $y = 2x + 1$.

b. Reflect the point $(-3, -2)$ in the line $y = -\frac{1}{2}x + 4$.

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Question 11

a. Reflect the graph of the line $y = 3x - 1$ in the line $y = 2x$.

b. Reflect the line $y = -x + 5$ in the line $y = \frac{1}{2}x + 1$.

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Question 12 Tech-Active.

Reflect the point $(-5, 3)$ in the line $y = 2x + 6$.

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Sub-Section: The 'Final Boss'

Question 13

A graph of the function $f(x) = \sqrt{x}$ is transformed in a sequence of steps.

a. The function is first reflected in the y-axis, then translated 2 units right and 3 units up. Write the equation of the resulting function.

b. The point $P\big(4, f(4)\big)$ is rotated 90° anti-clockwise about the origin. Find the coordinates of the image point.

c. Reflect the line $y = 2x - 3$ in the line $y = -2x$. Find the equation of the reflected line.

Section B: Supplementary Questions

Sub-Section [4.3.1]: Transformations of Graphs

Question 14

a. State the transformation matrix for dilation by a factor of 6 from the y-axis and a reflection around the x-axis.

b. Find the image of (x, y) under the transformation described in **part a.**

c. Consider an exponential function $j(x) = e^x$. The transformed graph is:

Question 15

a. State the transformation matrix for dilation by a factor of 3 parallel to the x-axis and a reflection around the y-axis.

b. Find the image of (x, y) under the transformation described in **part a.**

c. Consider a trigonometric function $n(x) = \cos(x)$. The transformed graph is:

Question 16

a. State the transformation matrix for dilation by a factor of 2 from the x-axis and a reflection around the y-axis.

b. Find the image of (x, y) under the transformation described in **part a.**

Consider a function $f(x) = 2\sin^{-1}(x-1) + \frac{\pi}{6}$.

It is known that all the points of $f(x)$ have been transformed by the transformation matrix found in **part a.**

c. Find the transformed graph.

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Sub-Section [4.3.2]: Rotations Around Points

Question 17

a. State the transformation matrix for a rotation around the origin 45° counterclockwise.

b. Hence, find the image of $(3, 3)$ after it has been rotated around the origin 45° counterclockwise.

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Question 18

a. State the transformation matrix for a rotation around the origin 60° clockwise.

b. Hence, find the image of $(0, 2)$ after it has been rotated around the origin 60° clockwise.

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Question 19

State the image of $(0, 0)$ after the rotation around the point $(3, -2)$ $120°$ anticlockwise.

Question 20

State the image of $(1, -5)$ after the rotation around the point $(-2, 1)$ $90°$ clockwise.

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Sub-Section [4.3.3]: Reflections in Lines

Question 21

Reflect the point $(-1, 3)$ across the line $y = \sqrt{3}x$.

Question 22

Reflect the point $(0, 1)$ across the line $y = 5x$.

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Question 23

State the image of $(-1, 1)$ after the reflection around the line $y = x - 4$.

Question 24

State the image of $(3, 2)$ after the reflection around the line $y = -2\left(x + \frac{1}{2}\right)$.

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Question 25

a. Find the equation of the line $y = 3x - 1$ after it undergoes a reflection in the line $y = -2x$.

b. Find the equation of the line $y = x + 4$ after it undergoes a reflection in the line $y = 3x + 2$.

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