REGULAR QUIZ 06

Form 5

Transformation of Graph

Part I – MC (@3marks)

1.	D	$y=(x+7)^2-10(x+7)+18+9$ $=x^2+14x+49-10x-70+27$ $=x^2+4x+6$
2.	D	/
3.	D	$y=f(5-(-x)-8)$ $=f(x-3)$
4.	A	$g(x)=\frac{1}{2}f(2x)$ So the graph of $f(x)$ reduce $\frac{1}{2}$ along x-axis, and then reduce $\frac{1}{2}$ along y-axis
5.	B	/
6.	B	Note that $\frac{5-1}{2}=2$ and period $=180°$.
7.	A	When $x=260°, y=-2$ $-2=-5\sin(260°k+\theta)+3$ $\sin(260°k+\theta)=1$ $260°k+\theta=90°$ By putting all the possible answers, $k=\frac{1}{2}, \theta=-40°$.

Part II – Short Questions (9 marks)

1. Let $y=f(x)$ be the original function.

(a) New function: $y=-(f(x)+8)$, i.e. 2M

$y=-(-4x^2+8x+12+8)$

$y=4x^2-8x-20$ 1A

(b) New function: $y=f\left(\frac{1}{2}(x-3)\right)$, i.e. 2M

$y=-4(\frac{x-3}{2})^2+8(\frac{x-3}{2})+12$

$y=-x^2+10x-9$ 1A

2. $y = \log_4 8x$

$= \log_4 x + \log_4 8$

$= \frac{1}{2}\log_2 x + \frac{3}{2}$ 1M

The graph of $y = \log_2 x$ first reduce $\frac{1}{2}$ along the y-axis, 1A

and then translate $\frac{3}{2}$ units upwards. 1A

Part III – Long Questions (16 marks)

1. (a) $f(x)$

$= -2x^2 - 12x + 9$

$= -2(x^2 + 6x) + 9$

$= -2(x^2 + 6x + 3^2 - 3^2) + 9$ 1M

$= -2(x+3)^2 + 27$ 1M

The coordinates of the vertex are $(-3, 27)$ 1A

(b)(i) $g(x)$

$= f(x+2) + 3$

$= -2(x+5)^2 + 30$ 1M

The axis of symmetry is $x = -5$ 1A

When $x = 0$,

$y = -2(5)^2 + 30 = -20$

The y-intercept is -20. 1A

(ii) $h(x)$

$= -g(x)$

$= 2(x+5)^2 - 30$ 1M

The coordinates of the vertex are $(-5, -30)$.

The minimum value of $h(x) = -30 < -20$

Thus, it is possible. 1A f.t.

2. (a) When $f(x) = 0$,

$x^2 - 2kx - 4k - 4 = 0$

$\Delta = (-2k)^2 - 4(-4k - 4)$ 1M

$= 4k^2 + 16k + 16$

$= 4(k+2)^2$ 1M

> 0

Thus, the graph of $f(x)$ cuts the x-axis. 1A f.t.

(b) $f(x)$

$= \frac{1}{k+2}(x^2 - 2kx + k^2 - k^2 - 4k - 4)$ 1M

$= \frac{1}{k+2}(x-k)^2 - \frac{1}{k+2}(k+2)^2$

$= \frac{1}{k+2}(x-k)^2 - k - 2$ 1M

$V = (k, -k-2)$ 1A

(c) $Q = (k, k+2)$

Note that VQ is the diagonal of the square.

$2 \times (k+2) = \sqrt{2} \times \sqrt{32}$ 1M

$2(k+2) = 8$

$k = 2$ 1A

Part IV - Bonus Part (5 marks)

1. (a) $\frac{x}{x+2} = A + \frac{B}{x+2}$

$x = A(x+2) + B$

$x = Ax + (2A + B)$

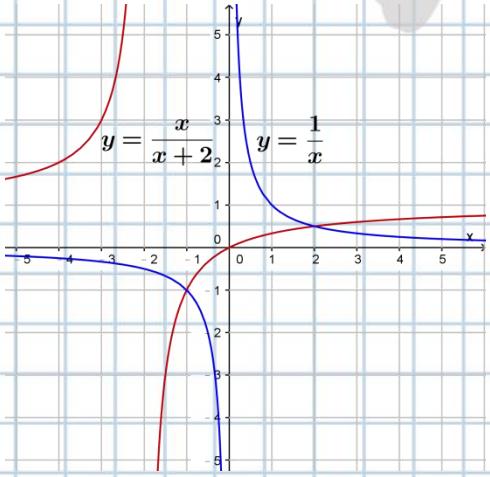
by comparing coefficients, $\begin{cases} A = 1 \\ 2A + B = 0 \end{cases}$, 1M

so, $A = 1, B = -2$ 1A

(b)(i) $y = \frac{x}{x+2}$ is the same as $y = 1 - \frac{2}{x+2}$

therefore, we can shift $y = \frac{1}{x}$ 2 units to the left, reflect it along $x-$axis, enlarge 2 times of the original along $y-$axis, and then translate it 1 unit upwards 2A

(ii)



1A