## **Functions Answers**

.

1. (a) E(8,0) (A1)(A1) 2 Notes: Brackets required. If missing award (A1)(A0). Accept x = 8, y = 0Award (A1) for x = 8

(b) 
$$y + \frac{1}{2}t = 4$$
 (M1)(M1)

*Notes:* (*M*1) for the equation of the line seen. (*M*1) for substituting t.

$$y = 4 - \frac{1}{2}t \tag{AG} 2$$

*Notes: Final line must be seen or previous (M1) mark is lost.* 

(c) Area = 
$$\frac{1}{2} \times \left(4 + 4 - \frac{1}{2}t\right) \times t$$
 (M1)(A1)

*Note:* (*M*1) for substituting in correct formula, (*A*1) for correct substitution.

$$= \frac{1}{2} \times \left( 8 - \frac{1}{2}t \right) \times t = \frac{1}{2} \left( 8t - \frac{1}{2}t^2 \right)$$
(A1)

$$= 4t - \frac{1}{4}t^2$$
 (AG) 3

Note: Final line must be seen or previous (A1) mark is lost

(d) 
$$4t - \frac{1}{4}t^2 = 9.75$$
 or any equivalent form. (A1)

**2.** (a) (i) 
$$a = 19$$
 (A1)  
(ii)  $b = 2$  (A1)

1

[12]

2

(b)	$c = \frac{360}{12}$	(M1)		(M1)
-----	----------------------	------	--	------

Or

For substituting a point from the graph in the equation.	(M1)	
c = 30	(AG)	1

3.5 < *x* < 8.5 (A1)(A1) 2 (c) Notes: (A1) for 3.5 and 8.5 seen, (A1) for strict

inequality signs seen. *Accept 3.48*<*x*<*8.52* (*found from GDC*)

3. (a)



*Notes:* (A1) for labels and some idea of scale. (A1) for x-intercept seen, (A1) for y-intercept seen in roughly the correct places (coordinates not required). (A1) for vertical asymptote seen, (A1) for horizontal asymptote seen in roughly the correct places (equations of the lines not required). (A1) for correct general shape.

(b) 
$$x = -4$$

*Note:* (A1) for x =, (A1)(ft) for -4

(A6)

6

[5]

(A1)(A1)(ft) 2



(x-5) (x + 2) **Note:** Award (A1) for (x + 5)(x-2), (A0) otherwise. If equation is equated to zero and solved by factorizing

award (A1) for both correct factors, followed by (A0).

4.

(a)

(A1)(A1)

(C2)

3

[17]

	(b)	<ul> <li>(i) -3, -2, -1, 0, 1, 2, 3</li> <li>Notes: Award (A2) for all correct answers seen and no others. Award (A1) for 3 correct answers seen.</li> </ul>	(A1)(A1)	(C2)	
		<ul> <li>(ii) -26,-7, 0, 1, 2, 9, 28</li> <li>Notes: Award (A2) for all correct answers seen and no others. Award (A1) for 3 correct answers seen. If domain and range are interchanged award (A0) for (b)(i) and (A1)(ft)(A1)(ft) for (b)(ii).</li> </ul>	(A1)(A1)	(C2)	[6]
5.	Unit	penalty (UP) is applicable where indicated.			
	(a)	4	(A1)	(C1)	
	(b)	11 m	(A1)	(C1)	
	(c)	Dividing 360 by 0.5	(M1)		
		12 hours	(A1) (UP)	(C2)	
	(d)	Halving their period, can be implied 20:00 (8pm). ( <i>ft</i> ) from ( <i>c</i> ), no ( <i>ft</i> ) if they do not halve the period.	(M1) (A1)(ft)	(C2)	[6]
6.	(a)	<i>a</i> = 1800	(A1)	(C1)	

(b)  $200 \times 3^6$  (or  $16\ 200 \times 9$ ) = 145 800 (M1)(A1) (C2)

(c)	$200 \times 3^n = 2 \times 10^6$ (where <i>n</i> is each 4 hour interval) (M1)	)	
	<i>Notes:</i> Award (M1) for attempting to set up the equation or writing a list of numbers.		
	$3^n = 10^4$		
	n = 8.38 (8.383613097) correct answer only (A1)	.)	
	Time = 33.5 hours (A1)(f	t)	
	<i>Notes:</i> Accept 34, 35 or 36 if previous A mark awarded (A1)(ft) for correctly multiplying their answer by 4.		
	If 34, 35 or 36 seen, or 32–36 seen, award (M1)(A0)(A0).	(C3)	[6]

7. (a) for attemptat substituted 
$$\frac{ydistance}{xdistance}$$
(M1)gradient = 2(A1)(G2)2

(b) 
$$2x-3$$
 (A1) for 2x, (A1) for -3 (A1)(A1) 2

(c) for their 
$$2x - 3 =$$
 their gradient and attempt to solve(M1) $x = 2.5$ (A1)(ft) $y = -5.25$  ((ft) from their x value)(A1)(ft)(G2)

(d)	for seeing $\frac{-1}{their(a)}$ solving $2x - 3 = -\frac{1}{2}$ (or their value)	(M1)(M1)	
	<i>x</i> = 1.25	(A1)(ft)(G1)	
	y = -6.1875	(A1)(ft)(G1)	4

(e)	(i)	$2 \times 2 - 3 = 1$ ((ft) from (b))	(A1)(ft)(G1)	
	(ii)	$y = mx + c$ or equivalent method to find $c \Rightarrow -6 = 2 + c$	(M1)	
		y = x - 8	(A1)(ft)(G2)	3

(f) 
$$x = 1.5$$
 (A1) 1

(g)	for substituting their answer to part (f) into the equation of $(1.5, -6.25)$ accept $x = 1.5$ , $y = -6.25$	f the parabola (M1) (A1)(ft)(G2)	
	gradient is zero (accept $\frac{dy}{dx} = 0$ )	(A1)	3
	u x		[18]
Unii	t penalty (UP) is applicable in part (i)(a)(c)(d)(e) and (f)		
(a)	90° C	(A1) (UP)	1
(b)	<i>y</i> = 16	(A1)	1

8.

- (c)  $16^{\circ}C$  (ft) from answer to part (b) (A1)(ft) 1 (UP)
- (d) 25.4°C (A1) 1 (UP)

(e)	for seeing $2^{0.75}$ or equivalent	(A1)	
	for multiplying their (d) by their $2^{0.75}$	(M1)	
	42.8°C	(A1)(ft)(G2) (UP)	3

(f) for seeing  $20 \times 2^{1.5t} = 100$  (A1) for seeing a value of t between 1.54 and 1.56 inclusive (M1)(A1) 1.55 minutes or 92.9 seconds (A1) (A1)(G3) 4 (UP)

[11]

**9.** (a)



(G3) 3

(b)	ine drawn with -ve gradient and +ve y-intercept 2.45, 2.11)	(G1)	
	(2.45, 2.11)	(G1)(G1)	3

(c)	$f'(1.7) = 3(1.7)^2 - 4(1.7) + 1$	(M1)	2
	<b>Note:</b> Award (M1) for substituting in their $f'(x)$		

2.87 (A1)(G2)

[8]

10.	(a)	p = -2	(A1)	
		q=4	(A1)	(C2)

(b)	(i)	domain = all real numbers except $x = 2$ <b>Note:</b> (A1) for $\mathbb{R}$ , (A1) for except $x = 2$ , (or equivalent notation)	(A1)(A1)	(C2)
	(ii)	range $g(x) > 0$ (accept $y > 0$ )	(A1)	
		OR		
		$(0,\infty)$	(A1)	
		OR		
		$0, \infty$ Note: Accent $0 < y < \infty$	(A1)	(C1)
	()	$\sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i$	( 1 1)	$(\mathbf{C}^{1})$
	(111)	x = 2 <b>Note:</b> must be an equation with x	(A1)	(CI)

[6]



(b) period =  $180^{\circ}$ 

(A1)(ft) (C1)

	(c)	amplitude = $\frac{1}{2}$	(A1)(ft)	(C1)
		2		[6]
12.	(i)	В	(A1)	
	(i) (ii)	D	(A1)	
	(iii)	А	(A1)	
	(iv)	Е	(A1)	
	(v)	С	(A1)	
	(vi)	F	(A1)	(C6) <b>[6]</b>