

Answer Key

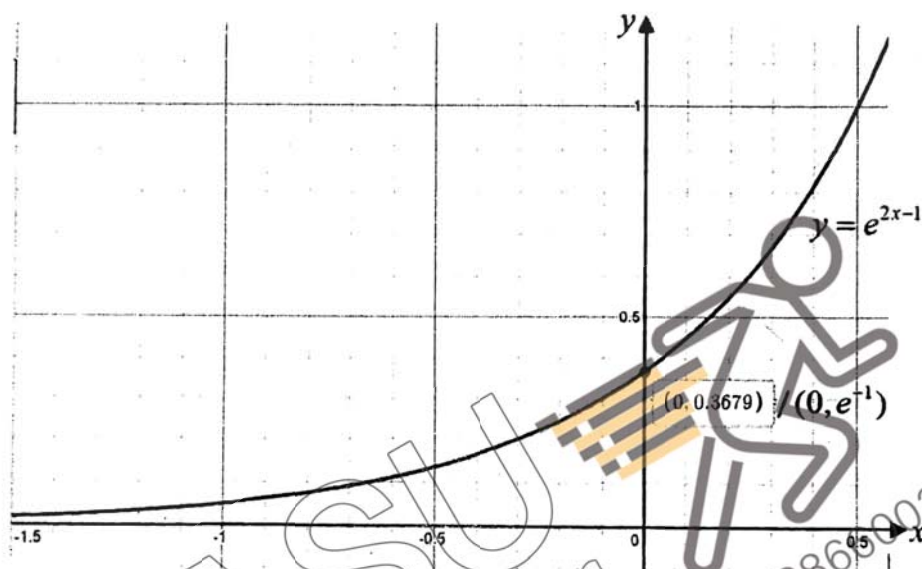
1 $6 - 4\sqrt{2}$

2 $-\frac{15}{8}$

3(i) $a = 0, 2\pi$

3(ii) Decreasing function

4(i)



4(ii) $k = 2$

5(a) $n < -6$ or $n > 6$

6 $a = \frac{3}{2}$

8 0.128 rad / s

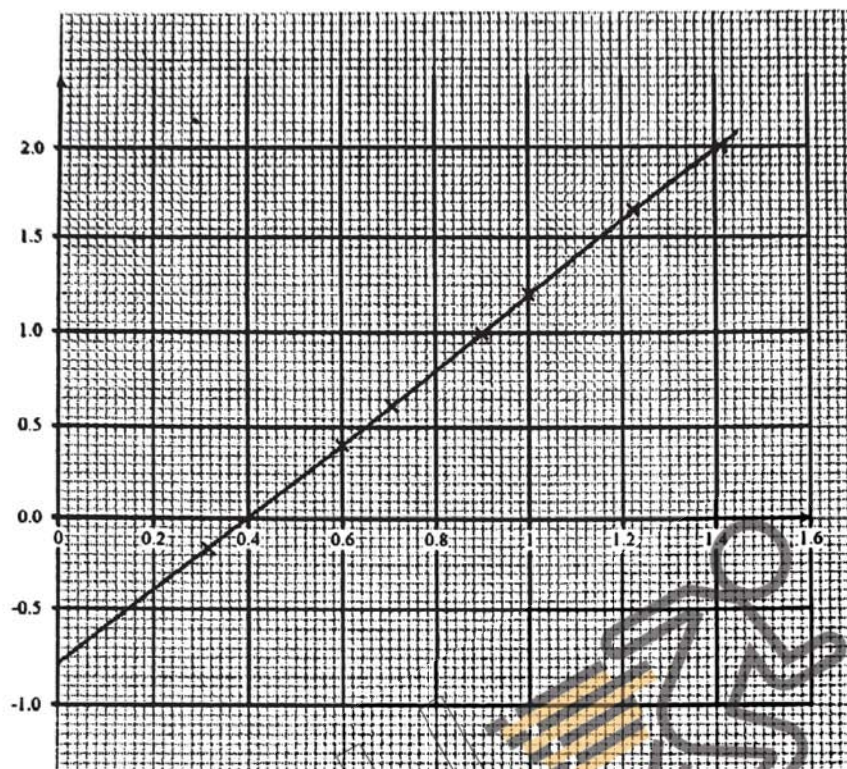
9 $p = -6, q = -1$

10(i) $x^2 + 3x^2 \ln x$

10(ii) $\int x^2 \ln x \, dx = \frac{1}{3}x^3 \ln x - \frac{1}{9}x^3 + c_2$, where c_2 is an arbitrary constant

10(iii) 0.639 unit^2 (3 s.f.)

11(i)



11(ii) $a = 2$ [1.5 to 2.5], $b = -1.6$ [-2.125 to -1.125]

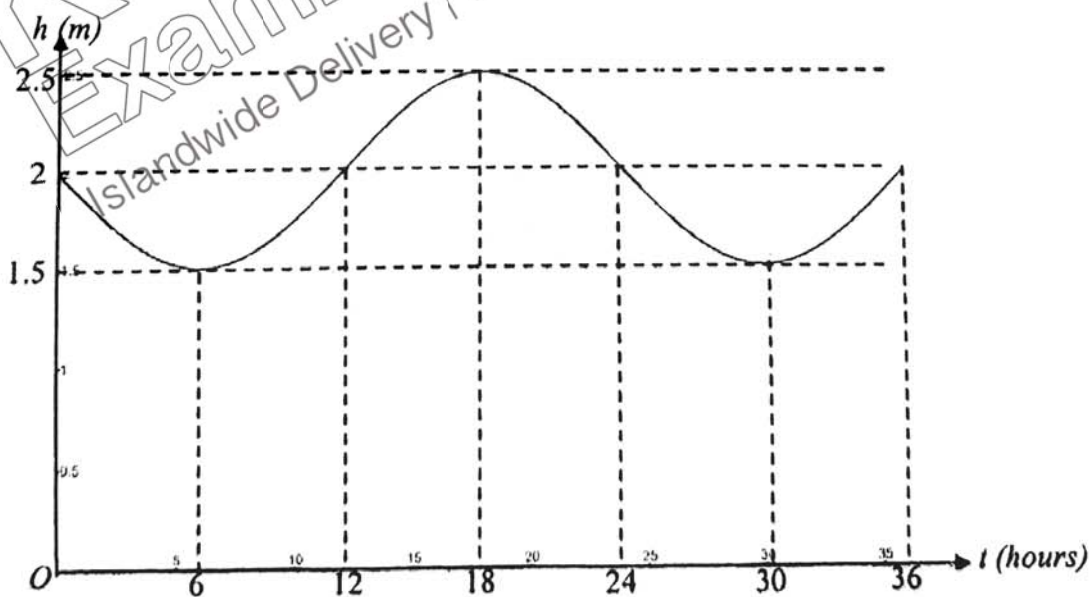
11(iii) -0.8

12(ii) $D(1, -1)$

12(iii) 20 units^2

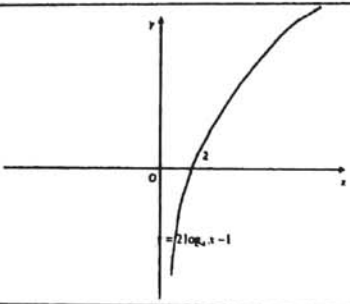
13(i) $a = -0.5$, $b = 2$, $k = \frac{\pi}{12}$

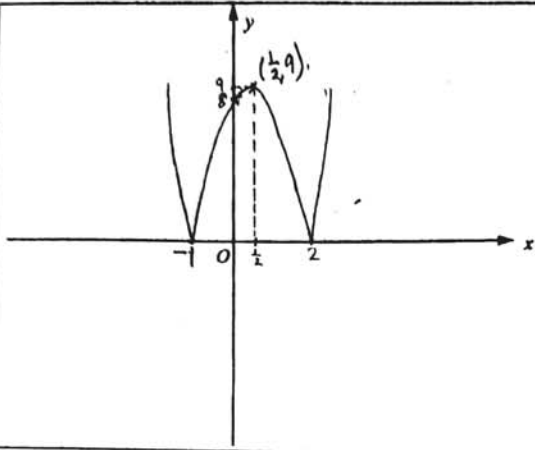
13(ii)



13(iii) $12.8 < t < 23.2$

Answer Key:

1a	40.5
b	
c	6561 or $\frac{1}{9}$
2(i)	-0.123
(ii)	$t = 5.81967$ (must have). In year 2015
(iii)	As t becomes very large (over a long period of time), $e^{-0.122604t}$ approaches 0. Then expected population is $P = 0.8(0 + 500) = 400$
3(i)	$x + \frac{5}{x} + \frac{1}{2x-1} - \frac{3}{(2x-1)^2}$
(ii)	$\frac{1}{10}x^2 + \ln x + \frac{1}{10}\ln(2x-1) + \frac{3}{10(2x-1)} + c$
4a(i)	$\binom{15}{r} (6)^{15-r} \left(-\frac{1}{2}\right)^r (x^{-30+3r})$
a(ii)	Power of $x = -30 + 3r$
a(iii)	-84440070
a(iv)	$-\frac{1430}{243}$
b	9
5a	$x = \frac{1}{3}$ or -7
b(i)	For $x \in \mathbb{R}$, $(2x-1)^2 \geq 0$ $(2x-1)^2 - 9 \geq -9$ $y \geq -9$ At $y = -9, x = \frac{1}{2}$. Hence lowest point is $\left(\frac{1}{2}, -9\right)$

b(ii)	
b(iii)	$-2 < m < 1$
6(i)	Product of the gradients of AB and $BC = (7) \times (-\frac{1}{7}) = -1$ $\therefore AB$ is perpendicular to BC .
(ii)	From (i), AB is perpendicular to BC implies that $\angle ABC = 90^\circ$. Due to $\angle$ in a semi-circle, AC is the diameter of the circle, and A, B and C are points on the circumference of the same circle.
(iii)	(3,3)
(iv)	$x^2 + (y+18)^2 = 100$.
7(ii)	$0, \frac{\pi}{3}, \frac{\pi}{9}$
8(i)	$L = \sqrt{12100t^2 + (48 - 90t)^2}$
(ii)	37.1
(iii)	L is minimum
9(i)	$S = 12 \cos \theta + 2 \sin \theta + 22$
(ii)	$S = 12.2 \cos(\theta - 9.5^\circ) + 22$
(iii)	32.2 m^2
10(i)	-3.125 m/s
(ii)	7 or 4.5
(iii)	117 m
(iv)	For all values of t , since $\frac{3}{10}t^2 > 0$, $v > 0$. Particle will not change its direction of motion since velocity is always positive.

