Answer Key

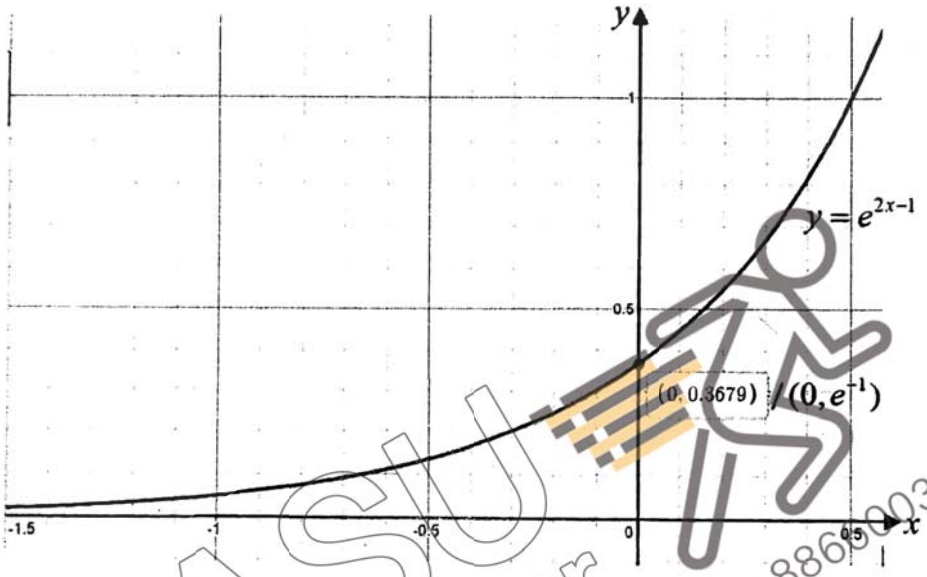
1 $6-4\sqrt{2}$

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

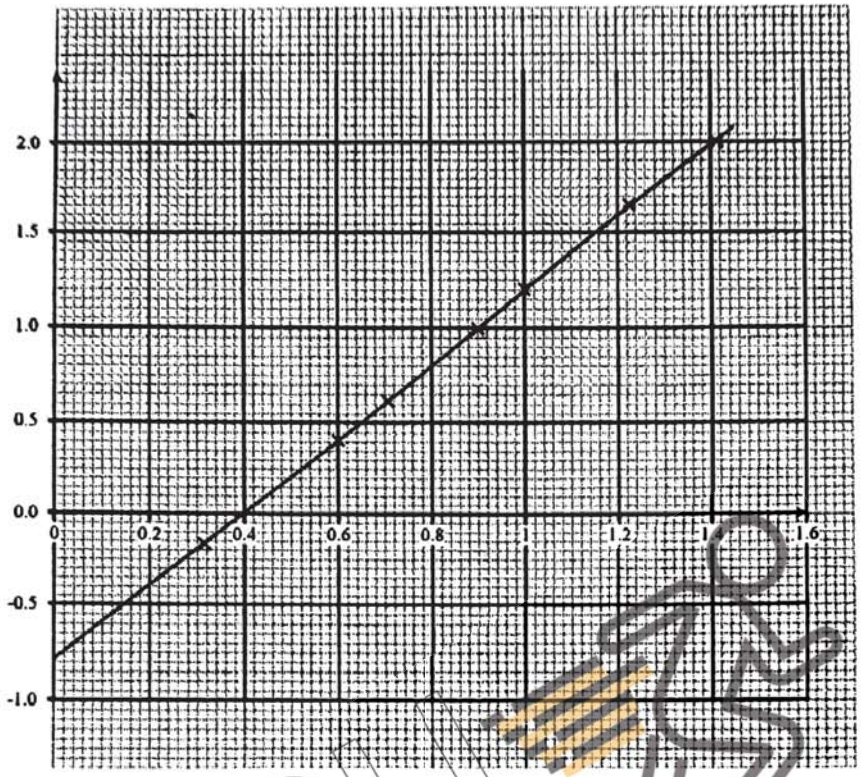
9 $p=-6,\ q=-1$

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)

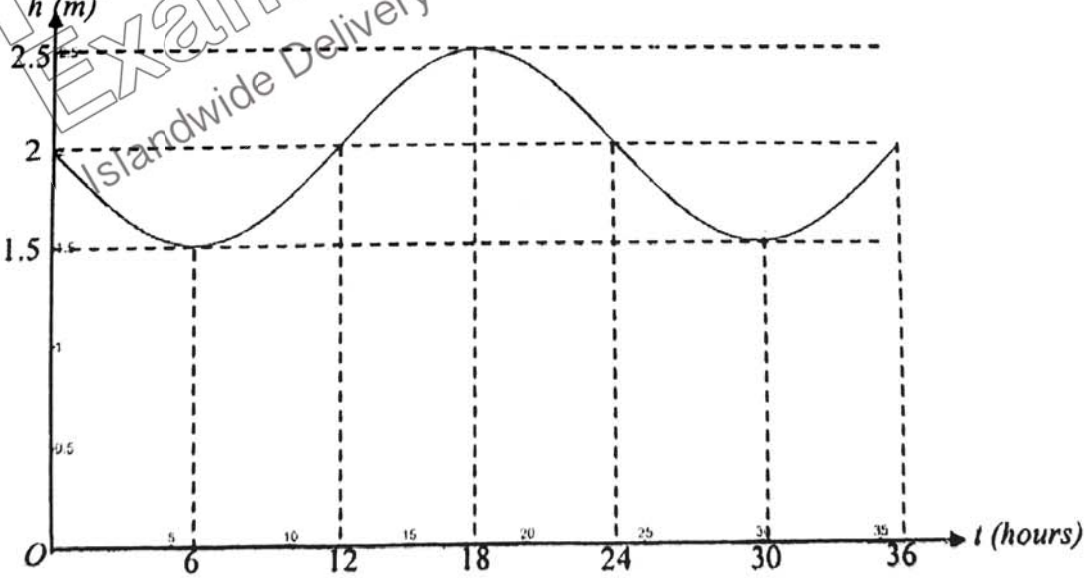


11(ii) $a = 2$ [1.5 to 2.5], $b = -1.6$ [-2.125 to -1.125] **11(iii)** -0.8

12(ii) $D(1, -1)$ **12(iii)** 20 units^2

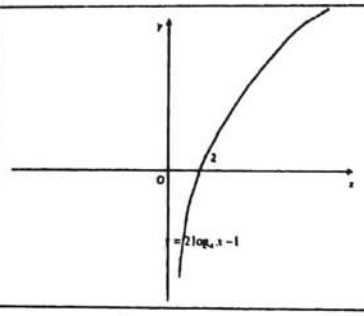
13(i) $a = -0.5,\ b = 2,\ k = \dfrac{\pi}{12}$

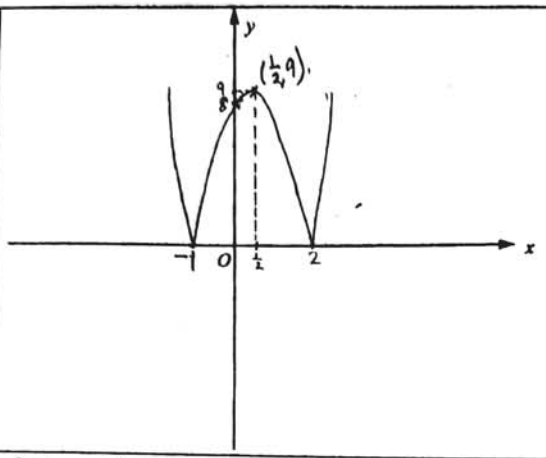
13(ii)



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)	$\binom{15}{r}(6)^{15-r}\left(-\frac{1}{2}\right)^r\left(x^{-30+3r}\right)$
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 $\angle ABC = 90°$. 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)	$S = 12.2\cos(\theta - 9.5°) + 22$
(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.