CEDAR GIRLS' SECONDARY SCHOOL
SECONDARY 4 ADDITIONAL MATHEMATICS
Answer Key for 2020 Preliminary Examination

PAPER 4047/1			
1(a)	$p=-6, q=1$	6(a)(i)	$(2x-1)^4(12x+29)$
1(b)	$x=1, y=2$	6(a)(ii)	$x<-\frac{29}{12}$
2(a)	Show discriminant >0 and curve opens upwards	6(b)	$p=-6,\ q=-36$
2(b)	$m<-8$ or $m>-4$	6(c)	-3 units per second
3(a)	$\frac{1}{k}+1$	7(i)	72 m/s^2
3(b)	1.60	7(ii)	$v=24(t^2-t-2)$ $=24\left(t-\frac{1}{2}\right)^2-54$ Since $\left(t-\frac{1}{2}\right)^2\geq 0$, $24\left(t-\frac{1}{2}\right)^2-54\geq -54$
4(a)	$\frac{455}{4}$		
4(b)(i)	$1-\frac{n}{3}x+\frac{n(n-1)}{18}x^2+\ldots$		
4(b)(ii)	$m=4,\ n=6,\ k=\frac{11}{3}$	7(iii)	620 m
5(i)	$(\sec A+\tan A)^2$ $=\left(\frac{1}{\cos A}+\frac{\sin A}{\cos A}\right)^2$ $=\left(\frac{1+\sin A}{\cos A}\right)^2$ $=\frac{(1+\sin A)^2}{1-\sin^2 A}$ $=\frac{1+\sin A}{1-\sin A}$	8(i)	Gradient of L_1 = $\tan\theta=\frac{4}{3}$, Gradient of L_2 = $-\frac{3}{4}$ Gradient of $L_1\times$ Gradient of L_2 $=\frac{4}{3}\times-\frac{3}{4}=-1$ Since product of gradients of L_1 and L_2 is -1, L_1 is perpendicular to L_2.
5(ii)	$199.5°, 340.5°, 559.5°, 700.5°$	8(ii)	$B(0,-3.5)$
9(ii)	0.503(3 sf)	8(iii)	37.5 sq units
9(i)	Length $QT=2(90\cos x)=180\cos x$ Area of rectangle, $QRST=50\times 180\cos x=9000\cos x$ Area of triangle $PQT=\frac{1}{2}(90)(90)\sin(180°-2x)$ $=4050\sin 2x$ Therefore, $A=4050\sin 2x+9000\cos x$ (shown)		

CEDAR GIRLS' SECONDARY SCHOOL
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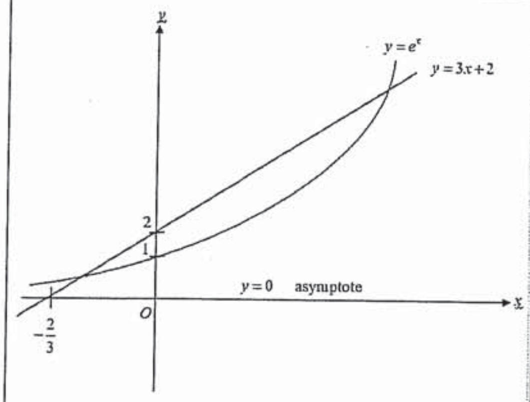
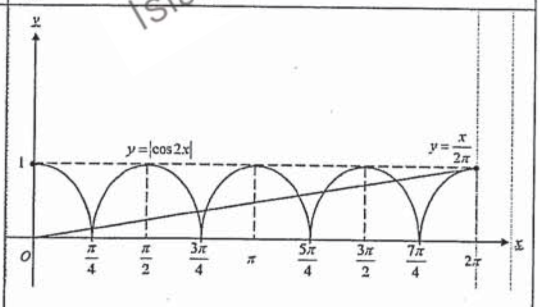
Answer Key for 2020 Prelim Examination Paper 2

PAPER 4047/2

1(i)	
(ii)	Draw $y=3x+2$ From the graph, there are two solutions.
2(a)(i)	$\frac{1-4\sqrt{5}}{9}$
2(a)(ii)	$-\frac{\sqrt{30}}{6}$
2(b)(i)	Highest tide occurs when $\sin kt=1$ Highest tide $= 1.1(1) + 1.8 = 2.9$ m (shown)
2(b)(ii)	period = 12.5 hours $\frac{2\pi}{k}=12.5$ $k=\frac{2\pi}{12.5}=\frac{4\pi}{25}$ (shown)
3(a)	$x=-\frac{1}{3}$
3(b)(ii)	$f(x)=(x-2)(2x-1)(x+3)$
3(b)(iii)	$\frac{1}{z}=x, z=\frac{1}{2},-\frac{1}{3},2$
4(i)	
4(ii)	8 solutions
5(i)	$A(-2,-125)$ $B(0,-81)$ $C(3,0)$
5(ii)	350 units^2
6(a)(i)	$\alpha^2+\beta^2=-\frac{5}{2}$ $\alpha^2\beta^2=-2$
6(a)(ii)	$4x^2-5x-2=0$
6(b)(i)	$y=\frac{4}{3}x+\frac{28}{3}$; $B(2,-12)$
6(b)(ii)	Radius = 5 units; Centre $(-1,8)$
6(b)(iii)	$\sqrt{(3+1)^2+(6-8)^2}=4.47$ units 4.47 units< radius of circle the point (3, 6) lies inside the circle
7(ii) 7(iii)	$k=0.029$; $m_0=77.5$ (3 s.f.) $t=24$h
8(a)	$24\sin^2 4x\cdot\cos 4x+4\cos^7\left(\frac{1}{2}x\right)\sin\left(\frac{1}{2}x\right)$
8(b)(i)	$a=-3, b=-9$
8(b)(ii)	P is a maximum point
9	$y=2e^{-2x}+13x+\ln 4-\frac{1}{2}$
10(a)(i)	25
10(a)(ii)	106 (3 s.f.)
10(b)(i)	$\frac{2-5x+8x^2}{(3x+2)(x^2+4)}=\frac{2}{3x+2}+\frac{2x-3}{x^2+4}$
10(b)(ii)	$\frac{d}{dx}\ln(x^2+4)=\frac{2x}{x^2+4}$
10(iii)	$\frac{11}{3}\ln\frac{8}{5}$
11(i)	$\cos\theta=\frac{AM}{r}$ $\sin\theta=\frac{OM}{r}$ $AM=r\cos\theta$ $OM=r\sin\theta$ $AD=2r\cos\theta$ $AB=2r\sin\theta$ perimeter of pentagon $=2r\sin\theta+2(2r\cos\theta)+2r$ $=2r(2\cos\theta+\sin\theta+1)$ (shown)
11(ii)	$2\cos\theta+\sin\theta=\sqrt{5}\cos(\theta-26.6°)$ (1 d.p.)
11(iii)	maximum perimeter = $2r(\sqrt{5}+1)$ cm corresponding $\theta=26.6°$ (1 d.p.)

ln m	4.02	3.66	3.30	2.94