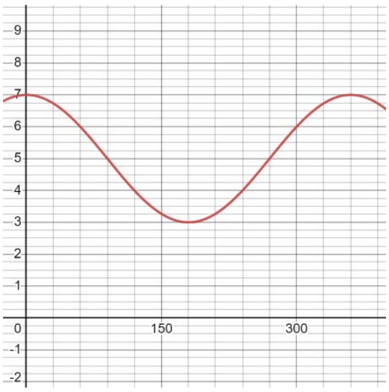
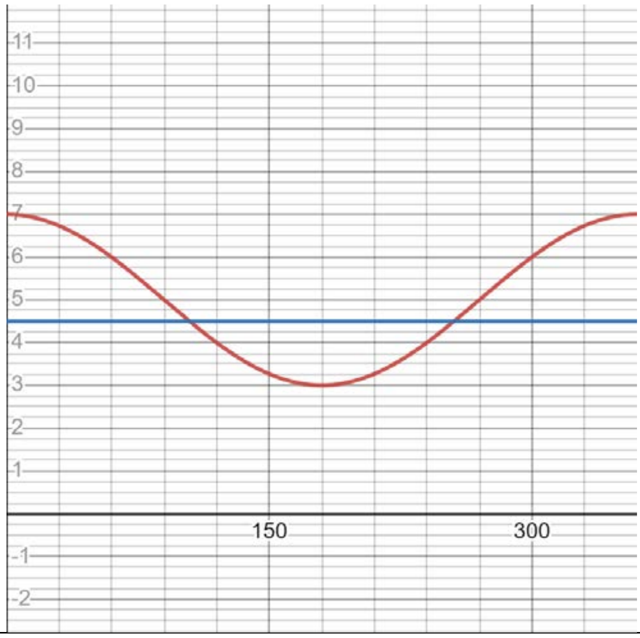
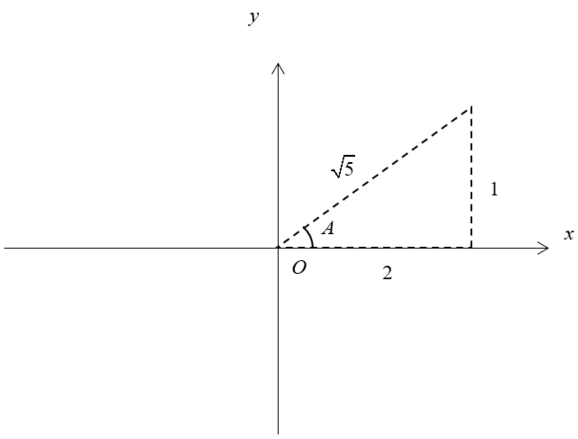
	2022 Yr 3 EXP End Year Exam P1 Solutions
1	Making x the subject from Eqn (1), $x=\dfrac{7+5y}{2}$ --- Eqn (3) Sub Eqn (3) into Eqn (2), $12(\dfrac{7+5y}{2})^2-5y^2=7$ $3(7+5y)^2-5y^2=7$ $70y^2+210y+140=0$ $y^2+3y+2=0$ $(y+1)(y+2)=0$ $y=-1 \text{ or } -2$ Sub the values of y into Eqn 3, When $y=-1$, $x=\dfrac{7+5(-1)}{2}$ $=1$ When $y=-2$, $x=-1.5$
2(i)	$m_{AB}=\dfrac{7-1}{-10-5}$ $=-\dfrac{2}{5}$ $Y-1=-\dfrac{2}{5}(X-5)$ $Y=-\dfrac{2}{5}X+3$ $\dfrac{1}{y}=-\dfrac{2}{5}x^2+3$ $\therefore y=\dfrac{5}{-2x^2+15}$ 1. Find eqn of straight line • gradient • Use $Y=mX+c$ or $Y-Y_1=m(X-X_1)$ 2. Derole
2(ii)	Sub $X=0, Y=3$ $\therefore k=3$
3(a)	$a=2,\ b=5$
3(b)	

	$2\cos x = -\frac{1}{2}$ $2\cos x + 5 = 4.5$ Insert $y = 4.5$, the number of solutions = 2 
4	$h = \sqrt{(\frac{10}{\sqrt{3}-1})^2 - (\frac{5}{\sqrt{3}-1})^2}$ $= \sqrt{\frac{75}{(\sqrt{3}-1)^2}}$ $= \frac{\sqrt{75}}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$ $= \frac{15+5\sqrt{3}}{3-1}$ $= \frac{15}{2} + \frac{5}{2}\sqrt{3}$
5(a)	$b^2 - 4ac < 0$ $[2(m-3)]^2 - 4(1)(25) < 0$ $4(m-3)^2 - 100 < 0$ $[2(m-3)-10][2(m-3)+10] < 0$ $(m-8)(m+2) < 0$ $\therefore -2 < m < 8$
5(b)	For $\frac{5}{-x^2+5x-6} > 0$,

	$-x^2+5x-6>0$ $-(x^2-5x+6)>0$ $x^2-5x+6<0$ $(x-2)(x-3)<0$ $\therefore 2<x<3$
6(a)	$\frac{P_0e^{3n}}{P_0}=2$ $e^{3n}=2$ $3n=\ln 2$ $n=\frac{\ln 2}{3}$ $=0.231$ (shown)
6(b)	% increase $=\frac{P_0e^{7(0.23105)}-P_0}{P_0}\times 100\%$ $=(e^{7(0.23105)}-1)\times 100\%$ $=404\%$ (3sf)
7(i)	 $\sin A=\frac{1}{\sqrt{5}}$
7(ii)	$\cos(-A)=\cos A$ $=\frac{2}{\sqrt{5}}$

7(iii)	$\sec(\frac{\pi}{2}-A)=\frac{1}{\cos(\frac{\pi}{2}-A)}$ $=\frac{1}{\sin A}$ $=\frac{1}{\frac{1}{\sqrt{5}}}$ $=\sqrt{5}$
8(a)	Comparing coefficient of x^3, $A=4$ Sub $x=-2$, $C=5$ Sub $x=0$, $-1=B(2)+5$ $B=-3$
8(b)	$\frac{3x-5}{(x+1)^2(x-3)}=\frac{A}{(x+1)}+\frac{B}{(x+1)^2}+\frac{C}{(x-3)}$ $3x-5=A(x+1)(x-3)+B(x-3)+C(x-1)^2$ Sub $x=3$, $4=16C$ $C=\frac{1}{4}$ Sub $x=-1$, $-8=-4B$ $B=2$ Sub $x=0$, $-5=A(-3)+2(-3)+\frac{1}{4}$ $A=-\frac{1}{4}$ $\therefore\frac{3x-5}{(x+1)^2(x-3)}=-\frac{1}{4(x+1)}+\frac{2}{(x+1)^2}+\frac{1}{4(x-3)}$
9(i)	$\log_{16}(\frac{1}{q})=\log_{16}1-\log_{16}q$ $=0-p$ $=-p$
9(ii)	$\log_4 q=\frac{\log_{16}q}{\log_{16}4}$ $=\frac{p}{\frac{1}{2}}$ $=2p$

9(iii)	$q = 16^p$ $\sqrt{q} = 16^{\frac{p}{2}}$ $= 4^p$
10(ai)	$m_{AB} = \frac{1}{2}$ $m_{AD} = -2$ Eqn of *AD*: $y - 3 = -2(x+4)$ $y = -2x - 5$ $\therefore D = (-2.5, 0)$
10(aii)	Midpoint of *AC* = midpoint of *BD* $(\frac{-4+x}{2}, \frac{3+y}{2}) = (\frac{-2.5+6}{2}, \frac{0+8}{2})$ $\therefore C = (7.5, 5)$
10(b)	<u>Method 1</u> $m_{BC} = -2$ $m_{BE} = \frac{8-3}{6-8.5}$ $= -2$ Since $m_{BC} = m_{BE}$ and there is a common point *B*, *B* , *C* and *E* are collinear <u>Method 2</u> Eqn of *BC:* $y - 8 = -2(x-6)$ $y = -2x + 20$ Sub $x = 8.5$, $y = -2(8.5) + 20$ $= 3$ Since the equation is fulfilled, hence *E* lies on *BC.* Therefore, they are collinear.