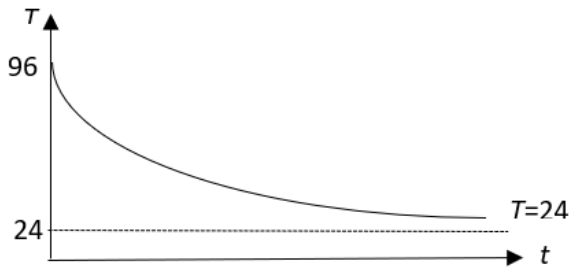
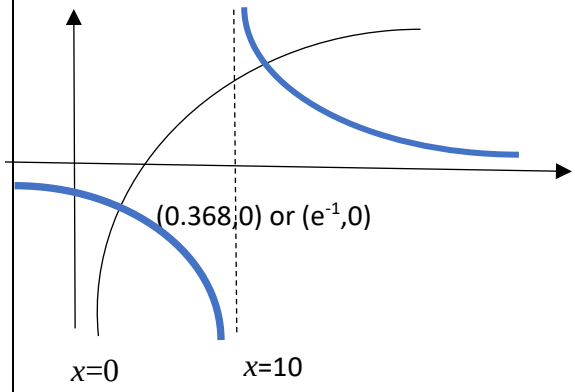
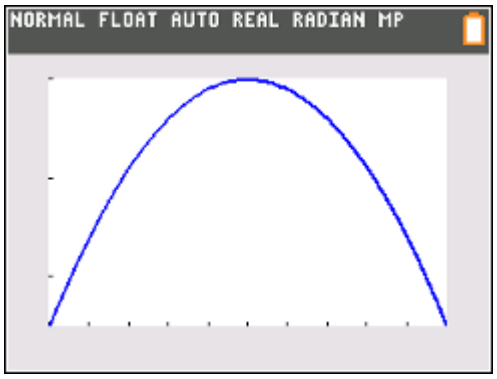
2023 JC1 H1 Math Solutions (Students)

Qn	Solutions
(1)	$x^2+x-1+k>2$ $x^2+x-3+k>0$ For $x^2+x-3+k>0$ for all real values of x, Discriminant = $1^2-4(-3+k)<0$ $4k>13$ $k>\frac{13}{4}=3.25$
2	$\log_\alpha \frac{x}{y}=\frac{9}{2}\Rightarrow \log_\alpha x-\log_\alpha y=\frac{9}{2}$ ---------(1) $\log_\alpha x^5y^2=5\Rightarrow 5\log_\alpha x+2\log_\alpha y=5$ ----------(2) (1)+(2)x2: we have $7\log_\alpha x=14$ $\therefore \log_\alpha x=2$
3 (i) (ii) (iii)	$T=24+72(0.9)^0$ $\therefore T=96\ ^oC$ $t\to\infty,\ 0.9^t\to 0$ $\therefore T\to 24$ T approaches/tends to 24 ^oC for large values of t. 

(iv)	Add the line $T = 28$ to curve in (iii), use GC to find the intersection point: t=27.4 minutes.
4 (i)	
(ii)	$\ln x = \dfrac{11-x}{x-10}$ $1+\ln x = 1+\dfrac{11-x}{x-10}$ Add $y = 1+\dfrac{11-x}{x-10}$ $= \dfrac{1}{x-10}$

(5)(i)	$13R+18J+40W=2830$ ……..(1) $18R(0.8)+30J(0.75)+40W(0.9)=2934$ $14.4R+22.5J+36W=2934$ ……..(2) $-4R+10W=165$ ……(3) From GC $R=50, J=40, W=36.5$ The manufacturing cost for a pair of walkers is \$36.50.
(ii)	The manufacturing cost of 10 pairs of walkers is \$165 more than the manufacturing cost of 4 pairs of runners.

(iii)



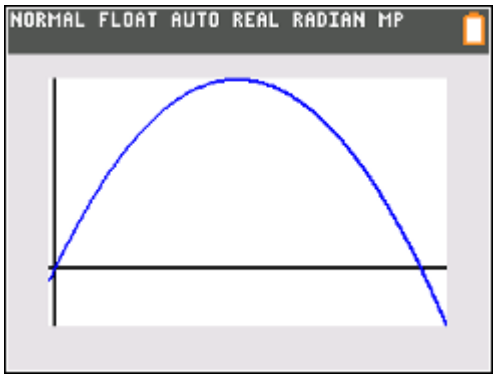
From GC maximum point is x=349.99994, P = 12248
Since x is an integer,
The number of pairs of shoes the manufacturer needs to manufacture is 350 and maximum profit is $12248.

Method 1

When $P = 0$, $0 = -\frac{x^2}{10} + 70x - 2$

x = 0.04286 or x = 699.957
The maximum number of shoes the manufacturer can manufacture so that the investment is profitable is 699 pairs of shoes

Method 2



From GC When $P \geq 0$

$0.0285726 \leq x \leq 699.9714$
Largest value of x is 699
The maximum number of shoes the manufacturer can manufacture so that the investment is profitable is 699 pairs of shoes