No.	SOLUTION
1a(i)	$a = 200$ $d = 225 - 200 = 25$ $T_{17} = 200 + 16(25)$ $= \$600$
(ii)	$S_{17} = \frac{17}{2}\left[2(200) + 16(25)\right]$ $= \$6,800$ $S_n = \frac{n}{2}\left[2(200) + (n-1)25\right] = 20,000$ $n\left[2(200) + (n-1)25\right] = 40000$ $375n^2 + 25n^2 - 40000 = 0$ $n^2 + 15n - 1600 = 0$ $n = 33.19$ or -33.195 (N.A.) On his 34th birthday, the amount will first exceed 20000.
1(b)	$f(x) = \begin{cases} \frac{1}{2}x, & -4 \le x < -2 \\ \sqrt{4 - x^2}, & -2 \le x \le 2 \\ -1, & 2 < x \le 4 \end{cases}$

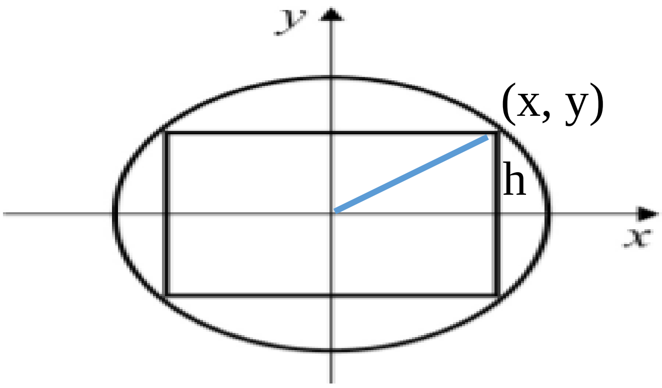
No.	SOLUTION
2a	$\frac{dx}{dt}=-\frac{2}{t^2}$ $\frac{dy}{dt}=2t$ $\frac{dy}{dt}=2t\times-\frac{t^2}{2}$ $=-t^3$
(b)	$\frac{dy}{dt}=-t^3$ $x=2,\frac{dy}{dt}=-8$ $x=2,t=2$ $y=(2)^2+1=5$ Gradient of normal $=\frac{1}{8}$ Equ of normal: $y-5=\frac{1}{8}(x-2)$ $8y-40=x-2$ $8y=x+38$ Cut y-axis: x=0, $y=\frac{19}{4}$ Coordinate the normal at x=2 cuts the y-axis at (0, 19/4)
(c)	$2y-x(y-1)=2$ $2(t^2+1)-\left(\frac{2}{t}+1\right)(t^2+1-1)=2$ $2t^2+2-2t-t^2=2$ $t^2-2t=0$ $t=0$ or $t=2$
(d)	$x=\frac{2}{t}+1\Rightarrow t=\frac{2}{x-1}$ $y=\left(\frac{2}{x-1}\right)^2+1$ $D=(-\infty,1)\cup(1,\infty)$ $R=(1,\infty)$

No.	SOLUTION
3a (i)	$\frac{w}{h}=\frac{16}{9}$ $h=\frac{9}{16}w\ldots(1)$ $d^2=w^2+h^2$ $d=\sqrt{w^2+h^2}$ or $-\sqrt{w^2+h^2}$ (N. A.) From (1) $d=\sqrt{w^2+\left(\frac{9}{16}w\right)^2}$ $=\sqrt{w^2\left(1+\frac{81}{256}\right)}$ $=\frac{\sqrt{337}}{16}w$
(ii)	when $w=16$, $d=\frac{\sqrt{337}}{16}(16)$ $=\sqrt{337}$ when $w=24$, $d=\frac{\sqrt{337}}{16}(24)$ $=\frac{3\sqrt{337}}{2}$ $R_d=\left[\sqrt{337},\frac{3\sqrt{337}}{2}\right]$
(iii)	max $w=24$ max $h=\frac{9}{16}(24)$ $=13.5$ Min. wall space needed is $24\times13.5=324$ in^2

No.	SOLUTION
3(b) (i)	$f(-x)=(-x)^4-2(-x)^2+1$ $=x^4-2x^2+1$ $=f(x)$ Hence, f(x) is an even function
(ii)	$f(-x)=\sin(-2x)$ $=-\sin(2x)$ $=-f(x)$ Hence, f(x) is an odd function
(iii)	$f(-x)=\dfrac{e^{-x}-1}{e^{-x}+1}$ $=\dfrac{\frac{1}{e^x}-1}{\frac{1}{e^x}+1}$ $=\dfrac{1-e^x}{1+e^x}$ $=-\left(\dfrac{e^x-1}{e^x+1}\right)$ $=-f(x)$ Hence, f(x) is an odd function
(c)	$\text{let } y=\dfrac{e^x-1}{e^x+1}$ $ye^x+y=e^x-1$ $e^x(y-1)=-1-y$ $e^x=\dfrac{-1-y}{y-1}$ $e^x=\dfrac{y+1}{1-y}$ $x=\ln\left(\dfrac{y+1}{1-y}\right)\Rightarrow f^{-1}(x)=\ln\left(\dfrac{x+1}{1-x}\right)$

No.	SOLUTION
4a. (i)	$y=\frac{2x+3}{4x^2+7}$ $\frac{dy}{dx}=\frac{\left(4x^2+7\right)(2)-(2x+3)(8x)}{\left(4x^2+7\right)^2}$ $=\frac{8x^2+14-16x^2-24x}{\left(4x^2+7\right)^2}$ $=\frac{14-24x-8x^2}{\left(4x^2+7\right)^2}$
(ii)	$\frac{dy}{dx}=\frac{14-24x-8x^2}{\left(4x^2+7\right)^2}$ $=\frac{2\left(7-12x-4x^2\right)}{\left(4x^2+7\right)^2}$ $=-\frac{2\left(4x^2+12x-7\right)}{\left(4x^2+7\right)^2}$ Since $4x^2+12x-7<0$, then $\frac{dy}{dx}$ is always > 0 due to the negative sign and the perfect square at the denominator.
(iii)	$x=0, y=\frac{3}{7}$ $\frac{dy}{dx}=\frac{2}{7}$ Equ of tangent: $y-\frac{3}{7}=\frac{2}{7}(x-0)$ $y=\frac{2}{7}x+\frac{3}{7}\ldots(1)$ $y=x+k\ldots(2)$. Solve (1) and (2): $\frac{14}{49}x+\frac{3}{7}=x+k$ $x=1$: $\frac{14}{49}(1)+\frac{3}{7}=1+k\Rightarrow k=-0.29$

No.	SOLUTION
4(b)	$f(x)=2x^2-x+5$ $f'(x) = \lim_{\Delta x\to 0}\left(\frac{f(x+\Delta x)-f(x)}{\Delta x}\right)$ $f'(x)=\lim_{\Delta x\to 0}\left(\frac{2(x+\Delta x)^2-(x+\Delta x)+5-(2x^2-x+5)}{\Delta x}\right)$ $=\lim_{\Delta x\to 0}\left(\frac{2x^2+4x\Delta x+2\Delta x^2-x-\Delta x+5-2x^2+x-5}{\Delta x}\right)$ $=\lim_{\Delta x\to 0}\left(\frac{4x\Delta x+2\Delta x^2-\Delta x}{\Delta x}\right)$ $=\lim_{\Delta x\to 0}(4x+2\Delta x-1)$ $=4x-1$

No.	SOLUTION
(c)	 Expression for area: $\text{Area} = 4xy$ $x^2 + y^2 = 5^2$ $y = \sqrt{25 - x^2}$ or $-\sqrt{25 - x^2}$ (N.A.) $\text{Area, A} = 4x\sqrt{25 - x^2}$ $\dfrac{dA}{dx} = 4x\left(\dfrac{-x}{\sqrt{25 - x^2}}\right) + 4\sqrt{25 - x^2}$ $= \dfrac{-4x^2 + 100 - 4x^2}{\sqrt{25 - x^2}}$ $= \dfrac{-8x^2 + 100}{\sqrt{25 - x^2}}$ $\dfrac{dA}{dx} = 0 : \dfrac{-8x^2 + 100}{\sqrt{25 - x^2}} = 0$ $8x^2 = 100$ $x = \sqrt{12.5}$ or $-\sqrt{12.5}(N.A)$ $\text{Max Area } = 4x\sqrt{25 - x^2}$ $= 4\sqrt{12.5}\sqrt{25 - 12.5}$ $= 50 \text{ cm}^2$