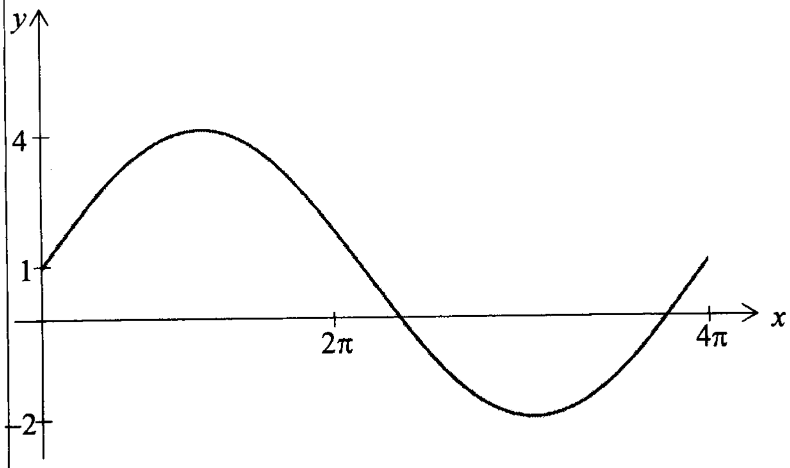
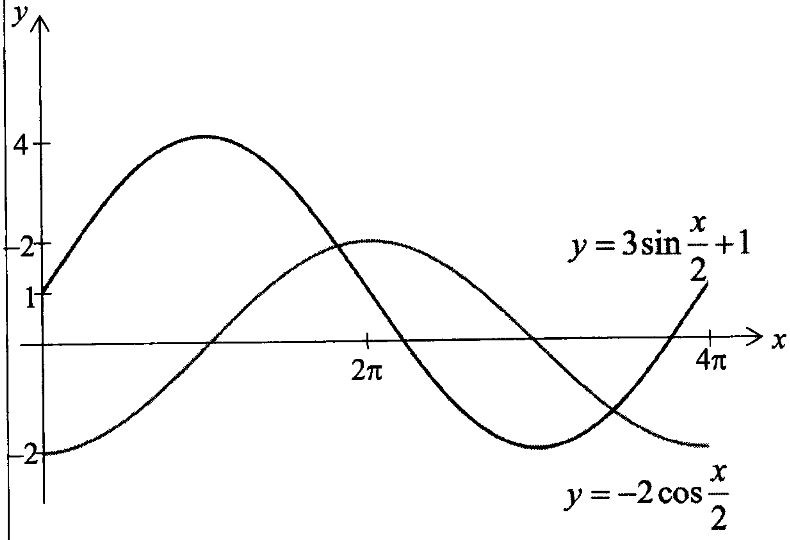
2025 A Math Prelim Paper 1 Solutions

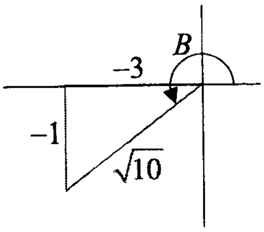
1. (a)	$V=\frac{1}{3}\pi r^2\left(\frac{3}{4}r\right)$ $=\frac{\pi}{4}r^3$
(b)	$\frac{\mathrm{d}v}{\mathrm{d}r}=\frac{3\pi}{4}r^2$ $\frac{\mathrm{d}v}{\mathrm{d}t}=\frac{\mathrm{d}v}{\mathrm{d}r}\times\frac{\mathrm{d}r}{\mathrm{d}t}$ $16=\frac{3\pi}{4}(8)^2\times\frac{\mathrm{d}r}{\mathrm{d}t}$ $\frac{\mathrm{d}r}{\mathrm{d}t}=\frac{1}{3\pi}=0.106\text{ cm/s}$
2.	$y=1-2x\quad ------(1)$ $x^2-xy-y^2+5=0\,------(2)$ Sub (1) into (2) $x^2-x(1-2x)-(1-2x)^2+5=0$ $x^2-x+2x^2-1+4x-4x^2+5=0$ $-x^2+3x+4=0$ $x^2-3x-4=0$ $(x-4)(x+1)=0$ $x=4\quad\text{or}\quad -1$ $y=-7\quad\text{or}\quad 3$ Length $=\sqrt{(4+1)^2+(-7-3)^2}$ $=\sqrt{125}$ $=5\sqrt{5}$ units

3(a)	$\frac{\mathrm{d}}{\mathrm{d}x}(2x-3)e^{2x} = 2e^{2x} + (2x-3)2e^{2x}$ $= 2e^{2x}(1+2x-3)$ $= 4e^{2x}(x-1)$
(b)	$\int 4e^{2x}(x-1)\,\mathrm{d}x = (2x-3)e^{2x} + c$ $\int 4xe^{2x}\,\mathrm{d}x - \int 4e^{2x}\,\mathrm{d}x = (2x-3)e^{2x} + c$ $\int 4xe^{2x}\,\mathrm{d}x = (2x-3)e^{2x} + \int 4e^{2x}\,\mathrm{d}x + c$ $\int 4xe^{2x}\,\mathrm{d}x = (2x-3)e^{2x} + 2e^{2x} + c$ $\int 4xe^{2x}\,\mathrm{d}x = (2x-1)e^{2x} + c$ $\int_0^1 4xe^{2x}\,\mathrm{d}x = \left[(2x-1)e^{2x}\right]_0^1$ $= e^2 - (-1)$ $= e^2 + 1$
4(a)	$\angle RSU = \angle RUS$ $(RS = RU)$ $= \angle URQ$ (alt seg thm) $\angle URQ = \angle RUQ$ $\therefore \Delta RQU$ is isosceles
(b)	$\angle RQS = 2\angle QRU$ (ext $\angle$ of a triangle, ΔRQU is isosceles) $\angle RQS = \angle SPT$ (angles in the same seg) $\angle QRU = \angle QPT$ (alt seg theorem) $\therefore \angle SPT = 2\angle QPT$

5(a)	$2x^2-8x+3=1-4x$ $2x^2-4x+2=0$ $2(x-1)^2=0$ $x=1$ Since there is only one intersection point between the curve and the line, the line is a tangent to the curve. Or Discriminant = $(-4)^2-4(2)(2)=0$ $\therefore$ line is a tangent to the curve Coordinates = $(1,-3)$
(b)	$(m+1)x^2-8x+3m>5$ $(m+1)x^2-8x+3m-5>0$ $(-8)^2-4(m+1)(3m-5)<0$ and $m+1>0$ $64-12m^2+8m+20<0$ $\qquad m>-1$ $12m^2-8m-84>0$ $3m^2-2m-21>0$ $(3m+7)(m-3)>0$ $m<-\frac{7}{3}$ or $m>3$ $\therefore\ m>3$
6(a)	$\begin{array}{r} x \quad -2 \\ 2x^2+1\overline{)\,2x^3-4x^2+x-2} \\ \underline{-(2x^3 \qquad +x)} \\ -4x^2 \qquad -2 \\ \underline{-(-4x^2 \qquad -2)} \\ 0 \end{array}$ $\therefore\ 2x^2+1$ is a factor since remainder = 0
(b)	$\frac{11x-5x^2-11}{(x-2)(2x^2+1)}=\frac{A}{x-2}+\frac{Bx+C}{2x^2+1}$ $11x-5x^2-11=A(2x^2+1)+(Bx+C)(x-2)$ Sub $x=2$, $-9=9A \Rightarrow A=-1$ Compare x^2, $-5=2A+B \Rightarrow B=-3$ Compare constants, $-11=A-2C \Rightarrow C=5$

	$\therefore \frac{11x-5x^2-11}{(x-2)(2x^2+1)}=-\frac{1}{x-2}+\frac{5-3x}{2x^2+1}$
7(a)	Amplitude =3 Period = 4π or 720°
(b)	
(c)	 $3\sin\frac{x}{2}+1=-2\cos\frac{x}{2}$ Sketch $y=-2\cos\frac{x}{2}$ Number of solutions = 2

8(a)	Centre of $C_1 = (2, y)$ Grad of normal = $\frac{3}{4}$ $\frac{y-6}{2-6}=\frac{3}{4}$ $y=\frac{3}{4}(-4)+6$ $=3$ $\therefore$ Centre of $C_1 = (2, 3)$ Radius = 5 units Equation of C_1: $(x-2)^2+(y-3)^2=25$
(b)	Let the centre $C_2 = (x, y)$ $\left(\frac{x+2}{2},\frac{y+3}{2}\right)=(6,6)$ $x=10,\ y=9$ Equation of C_2: $(x-10)^2+(y-9)^2=25$
9(a)	$\sin 105^\circ = \sin(45^\circ+60^\circ)$ $= \sin 45^\circ \cos 60^\circ + \cos 45^\circ \sin 60^\circ$ $=\frac{1}{\sqrt{2}}\left(\frac{1}{2}\right)+\left(\frac{1}{\sqrt{2}}\right)\left(\frac{\sqrt{3}}{2}\right)$ $=\frac{1+\sqrt{3}}{2\sqrt{2}}$ $=\frac{1}{4}\left(\sqrt{2}+\sqrt{6}\right)$
(b)	$\frac{\cos(A+B)}{\cos(A-B)}=\frac{2}{7}$ $\frac{\cos A\cos B-\sin A\sin B}{\cos A\cos B+\sin A\sin B}=\frac{2}{7}$ $7\cos A\cos B-7\sin A\sin B=2\cos A\cos B+2\sin A\sin B$ $\frac{5\cos A\cos B}{9\sin A\sin B}=1$ $\cot A\cot B=\frac{9}{5}$

(c)	$\tan B = \frac{1}{3}$  $\cos 2B = 2\cos^2 B - 1$ $= 2\left(-\frac{3}{\sqrt{10}}\right)^2 - 1$ $= \frac{4}{5}$ or $\cos 2B = 1 - 2\sin^2 B$ $= 1 - 2\left(-\frac{1}{\sqrt{10}}\right)^2$ $= \frac{4}{5}$ or $\cos 2B = \cos^2 B - \sin^2 B$ $= \left(-\frac{3}{\sqrt{10}}\right)^2 - \left(-\frac{1}{\sqrt{10}}\right)^2$ $= \frac{4}{5}$
10(a)	$V = \pi r^2 h$ $300 = \pi r^2 h$ $h = \frac{300}{\pi r^2}$
(b)	$A = 2\pi r^2 + 2\pi r\left(\frac{300}{\pi r^2}\right)$ $= 2\pi r^2 + \frac{600}{r}$ $C = 60\left(2\pi r^2\right) + 60\left(\frac{600}{r}\right)$ $= 120\pi r^2 + \frac{36000}{r}$ (Shown)

(c)

$$C = 120\pi r^2 + \frac{36000}{r}$$

$$\frac{\mathrm{d}C}{\mathrm{d}r} = 240\pi r - \frac{36000}{r^2}$$

$$\frac{\mathrm{d}C}{\mathrm{d}r} = 0$$

$$\Rightarrow \ 240\pi r - \frac{36000}{r^2} = 0$$

$$\Rightarrow \frac{36000}{r^2} = 240\pi r$$

$$\Rightarrow r^3 = \frac{36000}{240\pi}$$

$$\therefore r = 3.6278 = 3.63$$

$$\frac{\mathrm{d}C}{\mathrm{d}r} = 240\pi r - \frac{36000}{r^2}$$

$$\frac{\mathrm{d}^2C}{\mathrm{d}r^2} = 240\pi + \frac{72000}{r^3}$$

When $r = 3.6278$,

$C = 14884.9 = 14900$

$$\frac{\mathrm{d}^2C}{\mathrm{d}r^2} > 0 \Rightarrow \text{Minimum cost}$$

or

When $r = 3.6278$,

$C = 14884.9 = 14900$

x	3.63^-	3.63	3.63^+
$\frac{\mathrm{d}C}{\mathrm{d}r}$	$-$	0	$+$
slope	╲	—	╱

$\therefore$ minimum cost

11(a)	$L=13+6+AD+AB$ $=19+6\cos\theta+13\cos\theta+6\sin\theta+13\sin\theta$ $=19+19\cos\theta+19\sin\theta$
(b)	$R=\sqrt{19^2+19^2}=\sqrt{722}$ $\tan^{-1}(\alpha)=1$ $\alpha=45^\circ$ $L=19+\sqrt{722}\cos(\theta-45^\circ)$ Max $L=\sqrt{722}+19=45.9\text{m}$
(c)	$\sqrt{722}\cos(\theta-45^\circ)+19=45$ $\cos(\theta-45^\circ)=\dfrac{26}{\sqrt{722}}$ Basic angle $=\cos^{-1}\left(\dfrac{26}{\sqrt{722}}\right)$ $=14.620^\circ$ $\theta-45^\circ=-14.620^\circ,\ 14.620^\circ$ $\therefore\theta=30.4^\circ,\ 59.6^\circ$
12(a)	$y=\dfrac{1}{4}x^2-\dfrac{1}{2}\ln\left(\dfrac{x}{3}\right)$ $\dfrac{\mathrm{d}y}{\mathrm{d}x}=\dfrac{x}{2}-\dfrac{1}{2}\left(\dfrac{1}{3}\right)\left(\dfrac{3}{x}\right)$ $=\dfrac{x}{2}-\dfrac{1}{2x}$ When $x=3$, $\dfrac{\mathrm{d}y}{\mathrm{d}x}=\dfrac{4}{3}$ $y-2.25=\dfrac{4}{3}(x-3)$ $y=\dfrac{4}{3}x-\dfrac{7}{4}$ Hence $y=\dfrac{4}{3}x-1$ is not a tangent to the curve at P.
(b)	$\dfrac{\mathrm{d}}{\mathrm{d}x}\left[x\ln\dfrac{x}{3}-x\right]=x\left(\dfrac{3}{x}\right)\left(\dfrac{1}{3}\right)+\ln\left(\dfrac{x}{3}\right)-1$ $=\ln\left(\dfrac{x}{3}\right)$
(c)	Area $=\int_1^3\left[\dfrac{1}{4}x^2-\dfrac{1}{2}\ln\left(\dfrac{x}{3}\right)\right]\mathrm{d}x$

	$=\left[\frac{x^3}{12}\right]_1^3-\frac{1}{2}\left[x\ln\left(\frac{x}{3}\right)-x\right]_1^3$ $=\left[\frac{27}{12}-\frac{1}{12}\right]-\frac{1}{2}\left[\left(3\ln 1-3\right)-\left(\ln\frac{1}{3}-1\right)\right]$ $=\frac{13}{6}-\frac{1}{2}\left(-2-\ln\frac{1}{3}\right)$ $=\left(\frac{19}{6}+\frac{1}{2}\ln\frac{1}{3}\text{ or }\frac{19}{6}-\frac{1}{2}\ln 3\text{ or }\frac{19}{6}-\ln\sqrt{3}\text{ or }\frac{19}{6}+\ln\sqrt{\frac{1}{3}}\right)$ units^2

2025 A Math Prelim Paper 2 Solutions

1(a)	$\frac{60}{100}A = Ae^k$ $e^k = \frac{3}{5}$ $k = \ln\frac{3}{5}$ *or* $3000000 = 5000000e^k$ $\ln 3000000 = \ln(5000000e^k)$ $\ln 3000000 = \ln 5000000 + \ln e^k$ $\ln 3000000 = \ln 5000000 + k$ $k = \ln 3000000 - \ln 5000000 = \ln\frac{3}{5}$
(b)	$2000 = 5000000e^{\left(\ln\frac{3}{5}\right)t}$ $\left(\ln\frac{3}{5}\right)t = \ln\frac{2000}{5000000}$ $t= \frac{\ln\left(\frac{1}{2500}\right)}{\ln\left(\frac{3}{5}\right)}$ $t = 15.3$ min
2(a)	$49u^2 - 28u - 5 = 0$ $(7u-5)(7u+1) = 0$ $u = \frac{5}{7}$ or $u = -\frac{1}{7}$ $7^x = \frac{5}{7}$ or $7^x = -\frac{1}{7}$ (rej) $x = \log_7\frac{5}{7}$ $= \log_7 5 - \log_7 7$ $= \log_7 5 - 1$ Or

	$7^x=\frac{5}{7}$ $x\lg 7=\lg\frac{5}{7}$ $x=\frac{\lg\left(\frac{5}{7}\right)}{\lg 7}=\log_7\frac{5}{7}\quad[\log_a b=\frac{\log_c b}{\log_c a}]$ $Note:\frac{\lg A}{\lg B}\neq\lg(A-B)$
2 **(b)**	$\log_3(2x-1)-\log_9(x^2+2)=\log_{25}5$ $\log_3(2x-1)-\frac{\log_3(x^2+2)}{\log_3 9}=\frac{1}{2}$ $2\log_3(2x-1)-\log_3(x^2+2)=1$ $\log_3\frac{(2x-1)^2}{x^2+2}=\log_3 3$ $\frac{(2x-1)^2}{x^2+2}=3$ $4x^2-4x+1=3x^2+6$ $x^2-4x-5=0$ $(x-5)(x+1)=0$ $x=5$ or $x=-1$ (reject)

<table>
<tr><td>3(a)</td><td>$\frac{dy}{dx}=3x^2-6x+3$
$\frac{dy}{dx}=0$
$\Rightarrow 3x^2-6x+3=0$
$\Rightarrow 3(x-1)^2=0$
$x=1\ ,y=-6$
Coordinates of the stationary point are (1, –6).</td></tr>
<tr><td>(b)</td><td>
<table>
<tr><td>x</td><td>1^-</td><td>1</td><td>1^+</td></tr>
<tr><td>$\frac{dy}{dx}$</td><td>+</td><td>0</td><td>+</td></tr>
<tr><td></td><td>/</td><td>—</td><td>/</td></tr>
</table>
</td></tr>
</table>

	$(1,-6)$ is a point of inflexion.
4(a)	$h=2+\frac{4}{5}t-\frac{1}{250}t^2$ $=-\frac{1}{250}\left(t^2-200t\right)+2$ $=-\frac{1}{250}\left[\left(t-100\right)^2-100^2\right]+2$ $=-\frac{1}{250}\left(t-100\right)^2+40+2$ $=42-\frac{1}{250}\left(t-100\right)^2$
(b)	Max height = 42 m Time = 100 s
(c)	$42-\frac{1}{250}\left(t-100\right)^2=32$ $\frac{1}{250}\left(t-100\right)^2=10$ $\left(t-100\right)^2=2500$ $t=100\pm 50$ $t=50$ or 150 $\therefore$ length of time = 100s Or $42-\frac{1}{250}\left(t-100\right)^2\geq 32$ $\left(t-100\right)^2\leq 2500$ $\left[\left(t-100\right)^2-50^2\right]\leq 0$ $\left[\left(t-100\right)+50\right]\left[\left(t-100\right)-50\right]\leq 0$ $(t-50)(t-150)\leq 0$ $50\leq t\leq 150$ Duration=100s

5**(a)**	$f(x)=x^3+2kx+2$ $f(-2)=(-2)^3+2k(-2)+2$ $=-6-4k$ $f(1)=(1)^3+2k(1)+2$ $=2k+3$ $-6-4k=2k+3-3$ $6k=-6$ $k=-1$
(b)	$f(x)=2x^3-5x^2-3x+10$ $f(2)=2(2)^3-5(2)^2-3(2)+10$ $=0$ $\therefore$ $(x-2)$ is a factor $2x^3-5x^2-3x+10=(x-2)(2x^2+bx-5)$ Compare x^2, $-5=-4+b$ $b=-1$ $f(x)=(x-2)(2x^2-x-5)$ When $f(x)=0$. $x-2=0$ or $2x^2-x-5=0$ $x=2$ or $x=\dfrac{1\pm\sqrt{1-4(2)(-5)}}{4}$ $=\dfrac{1\pm\sqrt{41}}{4}$

6(a)	$T_{r+1} = \binom{6}{r}\left(x^4\right)^{6-r}\left(-\frac{1}{kx^2}\right)^r$ $= \binom{6}{r}\left(-\frac{1}{k}\right)^r\left(x^{24-4r}\right)x^{-2r}$ $= \binom{6}{r}\left(-\frac{1}{k}\right)^r x^{24-6r}$ Powers of $x = 24 - 6r$ Since 24 and $6r$ are even numbers, subtraction between even numbers will give an even number. $\therefore$ there are only even powers of x in this expansion.
(b)	$24-6r=0$ $r=4$ $\binom{6}{4}\left(-\frac{1}{k}\right)^4=\frac{5}{27}$ $\left(-\frac{1}{k}\right)^4=\frac{1}{81}$ $k=3$
(c)	$24-6r=-6$ $r=5$ Coefficient of $x^{-6}=\binom{6}{5}\left(-\frac{1}{3}\right)^5=-\frac{6}{243}=-\frac{2}{81}$ For the expansion $\left(2-3x^6\right)\left(x^4-\frac{1}{kx^2}\right)^6$ Term independent of $x = 2\left(\frac{5}{27}\right)-3\left(-\frac{6}{243}\right)$ $=\frac{10}{27}+\frac{2}{27}$ $=\frac{12}{27}$ $=\frac{4}{9}$

7(a)	When $t = 0$, $v = \cos\frac{\pi}{6} = \frac{\sqrt{3}}{2}$ m/s
(b)	When $v = 0$, $\cos(\frac{\pi}{4}t + \frac{\pi}{6}) = 0$ $\frac{\pi}{4}t + \frac{\pi}{6} = \frac{\pi}{2}$ or $\frac{\pi}{4}t + \frac{\pi}{6} = \frac{3\pi}{2}$ $t = \frac{4}{3}$ or $\frac{16}{3} = 1.33$ or 5.33 $\cos(\frac{\pi}{4}t + \frac{\pi}{6}) = 0$ $\frac{\pi}{4}t + \frac{\pi}{6} = \frac{\pi}{2}$ or $\frac{\pi}{4}t + \frac{\pi}{6} = \frac{3\pi}{2}$ $t = \frac{4}{3}$ or $\frac{16}{3} = 1.33$ or 5.33
(c)	$s = \int \cos(\frac{\pi}{4}t + \frac{\pi}{6})\ \mathrm{d}t$ $s = \frac{4}{\pi}\sin(\frac{\pi}{4}t + \frac{\pi}{6}) + c$ When $t = 0$, $s = \frac{1}{\pi}$, $\frac{1}{\pi} = \frac{4}{\pi}\left(\sin\frac{\pi}{6}\right) + c$ $\frac{1}{\pi} = \frac{4}{\pi}\left(\frac{1}{2}\right) + c$ $c = \frac{1}{\pi} - \frac{2}{\pi} = -\frac{1}{\pi}$ $\therefore s = \frac{4}{\pi}\left[\sin(\frac{\pi}{4}t + \frac{\pi}{6})\right] - \frac{1}{\pi}$ When $t = 0$ $s = \frac{1}{\pi}\text{m} = 0.31830$ m When $t = \frac{4}{3}$ $s = \frac{4}{\pi}\left(\sin\frac{\pi}{2}\right) - \frac{1}{\pi} = \frac{3}{\pi}\text{m}$ or 0.95492 m When $t = 4$ $s = \frac{4}{\pi}\left(\sin\frac{7\pi}{6}\right) - \frac{1}{\pi} = -\frac{3}{\pi}$ or -0.95492 m Total distance travelled = $\frac{2}{\pi} + \frac{3}{\pi} + \frac{3}{\pi} = \frac{8}{\pi}$ or 2.55 m

8(a)	$\text{LHS} = \sin^3 x \sec^2 x + \sin x$ $= \sin^3 x\left(\frac{1}{\cos^2 x}\right) + \sin x$ $= \tan^2 x \sin x + \sin x$ $= \sin x\left(\tan^2 x + 1\right)$ $= \sin x \sec^2 x$ $= \sin x\left(\frac{1}{\cos^2 x}\right)$ $= \tan x \sec x$ $= \text{RHS (shown)}$
(b)	$\tan x \sec x = 5$ $\frac{\sin x}{\cos x}\left(\frac{1}{\cos x}\right) = 5$ $\frac{\sin x}{\cos^2 x} = 5$ $\sin x = 5\left(1 - \sin^2 x\right)$ $5\sin^2 x + \sin x - 5 = 0$ $\sin x = \frac{-1 \pm \sqrt{(1)^2 - 4(5)(-5)}}{2(5)}$ $\sin x = 0.90498$ or -1.10498 (NA) Basic angle $= 64.8215°$ $x = 64.8°,\ 115.2°$

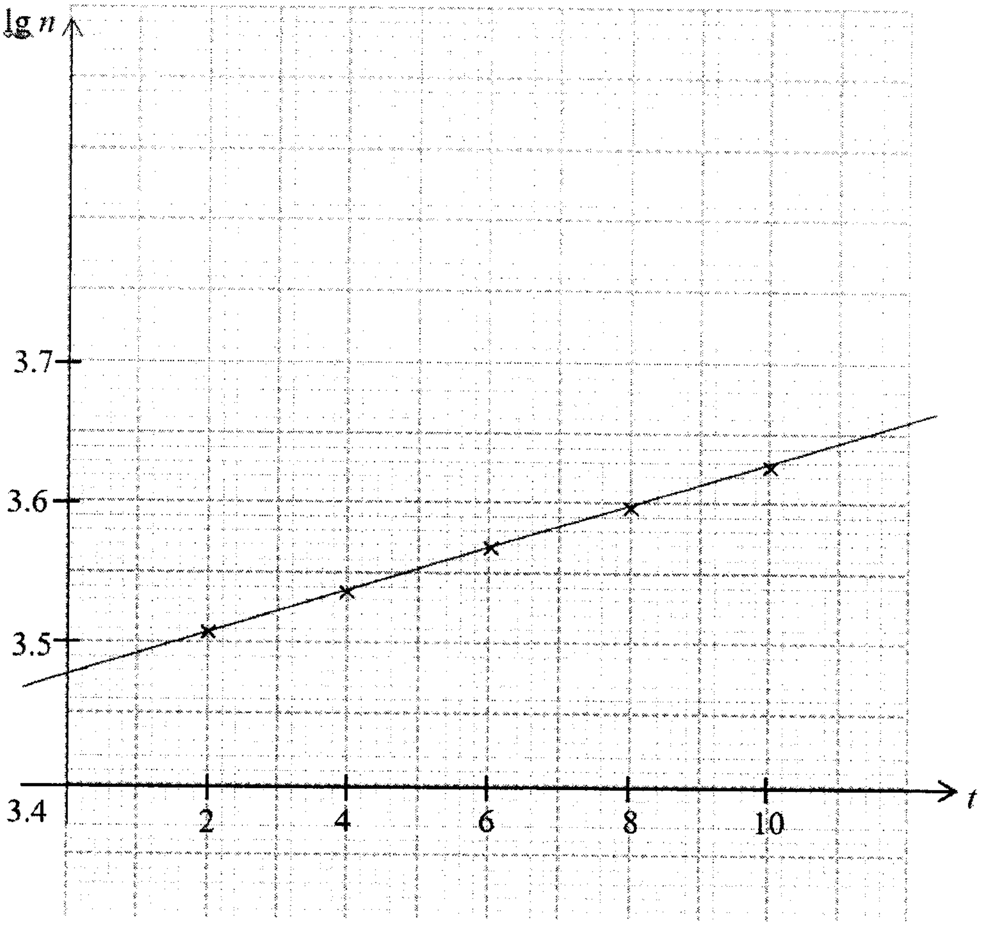
9(a)(i)	$y=\frac{2x-6}{x-2}$ $\frac{dy}{dx}=\frac{(x-2)(2)-(2x-6)(1)}{(x-2)^2}$ $=\frac{2}{(x-2)^2}$ When the curve meets the y-axis, $x=0$ $\frac{dy}{dx}=\frac{2}{(0-2)^2}=\frac{1}{2}$ Gradient of normal = -2 $x=0, y=3$ Equation of normal is $y-3=-2(x-0)$ $y=-2x+3$
9(a)(ii)	For $x>2,\ x-2>0$, $\Rightarrow (x-2)^2>0$ Since $\frac{dy}{dx}=\frac{2}{(x-2)^2}$>0 for x >2, y is an increasing function.

9b	$\frac{d^2y}{dx^2}=(3x+1)^2$ $\frac{dy}{dx}=\int(3x+1)^2\,dx$ $=\frac{(3x+1)^3}{(3)(3)}+C$ $=\frac{(3x+1)^3}{9}+C$ $\frac{dy}{dx}=45,\ x=2,$ $45=\frac{343}{9}+C$ $C=\frac{62}{9}$ $\frac{dy}{dx}=\frac{(3x+1)^3}{9}+\frac{62}{9}$ $y=\int\left[\frac{(3x+1)^3}{9}+\frac{62}{9}\right]dx$ $y=\frac{(3x+1)^4}{108}+\frac{62}{9}x+D$ $36=\frac{2401}{108}+\frac{124}{9}+D$ $D=-\frac{1}{108}$ $\therefore y=\frac{(3x+1)^4}{108}+\frac{62}{9}x-\frac{1}{108}$

Solution 1

10(a)	$n = n_0(2)^{kt}$ $\lg n = \lg n_0 + (k\lg 2)t$ Draw a straight line of $\lg n$ against *t*. Best fit line
(b)	$\lg n_o = 3.48$ $n_o = 10^{3.48}$ $= 3020$
(c)	$k\lg 2 = \frac{3.584 - 3.48}{7}$ $k = 0.0494$
(d)	$\lg\left[1.25\left(10^{3.48}\right)\right] = 3.58$ $t = 6.7$ (6.6 - 7.2)

t	2	4	6	8	10
$\lg n$	3.51	3.54	3.57	3.60	3.63


lg n
3.7
3.6
3.5
3.4
2
4
6
8
10
t

Solution 2

<table>
<tr><td>10(a)</td><td>

$n = n_0 (2)^{kt}$

$\ln n = \ln(n_o) + (k \ln 2)t$

Draw a straight line of $\ln n$ against t.

<table>
<tr><td>t</td><td>2</td><td>4</td><td>6</td><td>8</td><td>10</td></tr>
<tr><td>$\ln n$</td><td>8.08</td><td>8.14</td><td>8.21</td><td>8.28</td><td>8.35</td></tr>
</table>

Best fit line

</td></tr>
<tr><td>(b)</td><td>

$\ln n_o = 8.00$

$n_o = e^8$

$= 2980.957$

$= 2980$

</td></tr>
<tr><td>(c)

(d)</td><td>

$k \ln 2 = \frac{8.35 - 8.0}{10}$

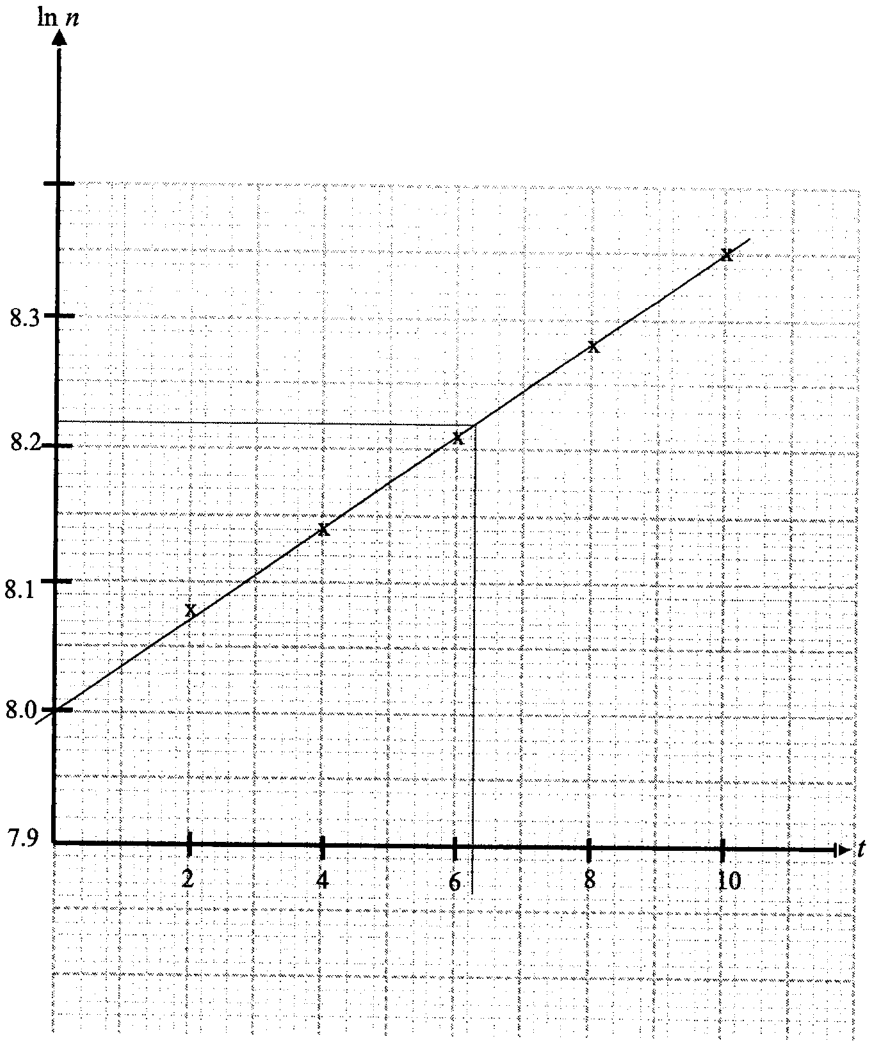
$k = 0.050494$

$= 0.0505$

$\ln\left[1.25\left(e^8\right)\right] = 8.223$

$t = 6.3$ (6.0 - 6.6)

</td></tr>
</table>


ln n
8.3
8.2
8.1
8.0
7.9
2
4
6
8
10
t

11(a) Let $B = (x,\ y)$

Distance $AB = \sqrt{(x-6)^2+(y-8)^2} = 15$

$$(x-6)^2+(y-8)^2 = 225 \text{ ------ (1)}$$

Grad $AB = \frac{4}{3}$

Equation of AB: $y = \frac{4}{3}x$ ------ (2)

Solving, $(x-6)^2+\left(\frac{4}{3}x-8\right)^2 = 225$

$$\frac{25}{9}x^2-\frac{100}{3}x-125=0$$

$$x^2-12x-45=0$$

$$(x+3)(x-15)=0$$

$$x=-3 \quad \text{or} \quad x=15 \text{ (rej)}$$

$$y=-4$$

$\therefore B=(-3,\ -4)$

Or

Distance $OA = \sqrt{6^2+8^2} = 10$ units

Distance $OB = 5$ units

Let $B = (x,\ y)$

By ratio theorem,

$$\frac{5(6)+10x}{15}=0, \quad \frac{5(8)+10y}{15}=0$$

$\therefore B=(-3,\ -4)$

(b) Grad $BC = -\frac{3}{4}$

$$y=-\frac{3}{4}x+c$$

$$-4=-\frac{3}{4}(-3)+c \Rightarrow c=-\frac{25}{4}$$

Coordinates of $C = \left(0, -\frac{25}{4}\right)$

Let $D = (x,\ 0)$

$$\frac{\frac{25}{4}}{x}=\frac{4}{3}$$

$$x=\frac{75}{16}$$

Coordinates of $D = \left(\frac{75}{16}, 0\right)$

(c)	Area $= \frac{1}{2}\begin{vmatrix} 6 & -3 & 0 & \frac{75}{16} & 6 \\ 8 & -4 & -\frac{25}{4} & 0 & 8 \end{vmatrix}$ $= \frac{1}{2}\left\lvert -24+\frac{75}{4}+\frac{75}{2}-\left(-24-\frac{1875}{64}\right)\right\rvert$ $= \frac{5475}{128}$ or $42\frac{99}{128}$ or 42.8 units^2 or Area$=\frac{1}{2}(AB+CD)(BC)$ $=\frac{1}{2}\left(15+\frac{125}{16}\right)\left(\frac{15}{4}\right)=\frac{5475}{128}$