2006
INTERNAL EXAMINATION

Mathematics

General Instructions
- Reading time – 5 minutes
- Working time – 3 hours
- Write using black or blue pen
- Board-approved calculators may be used
- A table of standard integrals is provided at the back of this paper
- All necessary working should be shown in every question

Total marks – 120
- Attempt Questions 1–10
- All questions are of equal value

Question One

(a) Evaluate $\sqrt[3]{\dfrac{315.6}{15.7+21}}$ correct to two decimal places **2**

(b) Factorise $8x^3+1$ **2**

(c) Find the integral of $2\sin x + x$ **2**

(d) Express $\dfrac{x-1}{3}-\dfrac{4x-1}{2}$ in simplest form. **2**

(e) If $x^2 \le 16$, find values of x for which this will be true. **2**

(f) For the circle $x^2+(y+1)^2=3$, write down :

(i) the radius **1**

(ii) the centre **1**

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20/6/2006

Question Two Use a SEPARATE writing booklet.
Marks

(a) Solve $\tan\theta = \frac{1}{\sqrt{3}} \quad 0 \le \theta \le 2\pi$ **2**

(b) Differentiate with respect to x:

(i) $x^2 \cos x$ **2**

(ii) $\frac{x^3}{x+1}$ **2**

(c) (i) Find $\int \frac{8x^3}{x^4 - 2}\,dx$ **2**

(ii) Evaluate $\int_0^{\frac{\pi}{3}} \sin 2x\,dx$ (give your answer correct to 3 decimal places). **2**

(d) Find the equation of the tangent to $y = e^x$ at the point $(0,1)$. **2**

Question Three Use a SEPARATE writing booklet.
Marks

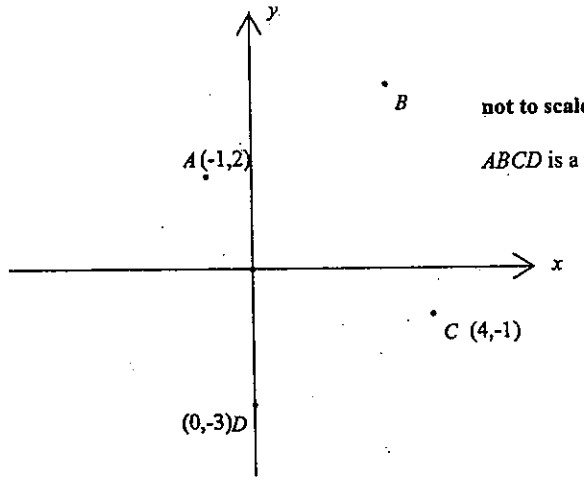
(a) Evaluate $\sum_{n=10}^{13}(n^2+1)$ **1**

(b) The sides of a triangle are 10cm, 11cm and 12 cm.

(i) Find the size of the smallest angle. **2**

(ii) Find the area of the triangle **1**

(c)



not to scale

ABCD is a rhombus

(i) Show that the gradient of *AD* is -5 **1**

(ii) Show that the equation of *AD* is $5x + y + 3 = 0$ **2**

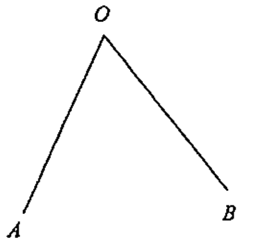
(iii) Find the midpoint of *AC* **1**

(iv) Use your answer in (iii) to find the coordinates of *B*. **2**

(v) Given that *AC* has length $\sqrt{34}$ find the area of *ABCD* **2**

Question Four Use a SEPARATE writing booklet. **Marks**

(a) In the diagram $OA = OB = 1.2\text{m}$. The $\angle BAO = 0.7$ radians. O is the centre of the circle. A and B are points on a circle, centred at O.



(i) Find the length of the arc AB. 1

(ii) Find the straight line distance AB. 2

(iii) Find the area of the sector OAB. 1

(b) A function $f(x)$ is defined by $f(x) = (x-2)(x^2-4)$

(i) Find all solutions of $f(x) = 0$ 2

(ii) Find any turning points of $y = f(x)$, and determine their nature 3

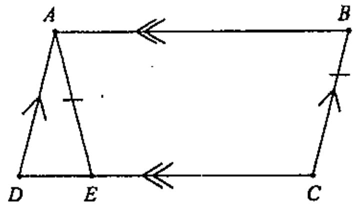
(iii) Sketch $y = f(x)$ showing turning points and points where the curve cuts the axes. 2

(iv) For what values of x is $y = f(x)$ concave down? 1

Question Five Use a SEPARATE writing booklet.
Marks

(a) Use the change of base law to evaluate $\log_5 9$ correct to two decimal places. 2

(b)



$ABCD$ is a parallelogram and $\angle ABC = 60^\circ$. AE is drawn to meet OD such that $AE = BC$.

(i) Copy the diagram into your answer booklet

(ii) Prove that ΔAED is equilateral. 3

(c) (i) If $y = \ln(x+1)$, find the gradient function. 1

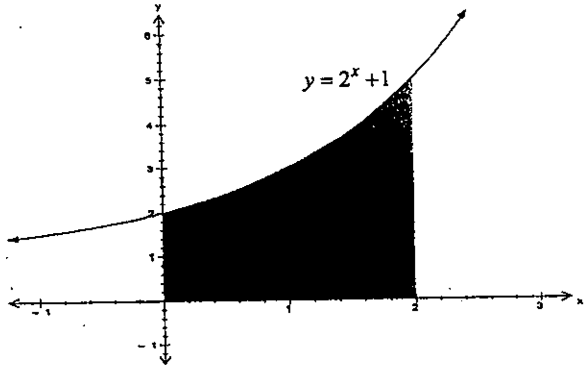
(ii) Find any points on the curve $y = \ln(x+1)$ at which the tangent is parallel to $y = \frac{1}{2}x + 3$. 2

(d) (i) Factorise $2a^2 - 7a + 3$. 1

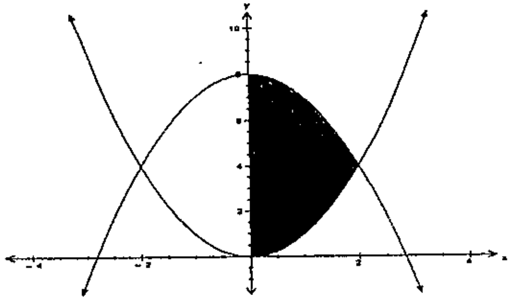
(ii) Hence solve $2(\log_2 x)^2 - 7\log_2 x + 3 = 0$ 3

Question Six Use a SEPARATE writing booklet. **Marks**

(a) Use Simpson's Rule with 3 function values to find the shaded area. 3



(b) The curves $y = x^2$ and $y = 8 - x^2$ are sketched below



(i) Find the points of intersection of the two curves. 2

(ii) The shaded area between the curves and the y - axis is rotated about the y-axis. By splitting the shaded area into 2 parts, or otherwise, find the volume of the solid formed 4

(c) If $y = \ln\left(\dfrac{\sqrt{x-1}}{x^3+5}\right)$, find $\dfrac{dy}{dx}$. 3

Question Seven Use a SEPARATE writing booklet.
Marks

(a) (i) Sketch the graph of $y = \sin x$, for $0 \le x \le 2\pi$ 1

(ii) Solve $\sin x = \frac{1}{2}$, for $0 \le x \le 2\pi$ 2

(iii) Hence find the values of x for which $\sin x < \frac{1}{2}$, for $0 \le x \le 2\pi$ 2

(b) In an arithmetic sequence $T_{10} = 35$ and $T_{16} = 59$

(i) find the value of a. 1

(ii) find the value of d. 1

(iii) find T_{100} 1

(iv) What will be the value of the first term that is greater than 750? 1

(c) A geometric series has a first term of 4 and a limiting sum of 12.
Find the common ratio. 3

Question Eight Use a SEPARATE writing booklet.
Marks

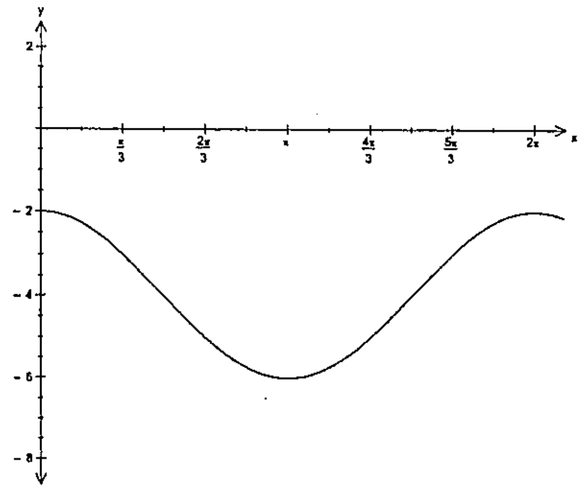
(a) Find the value(s) of m for which the equation $x^2+4mx+8-4m=0$ has equal roots. **3**

(b) A graduate earns \$48000 per annum in her first year and then in each successive year her salary rises by \$2400.

(i) What is her salary in the 10^{th} year? **2**

(ii) What are her total earnings over the ten years? **1**

(c) The graph of $A + B\cos Cx$ is given below.



(i) State the period of the curve. **1**

(ii) Hence or otherwise determine the values of A, B and C. **3**

(d) Over what domain is the function $y=\sqrt{x^2-9}$ defined? **2**

Question Nine Use a SEPARATE writing booklet. **Marks**

(a) A cylindrical can of radius r centimetres and height h centimetres is to be made from a sheet of metal with area 270π square centimetres.

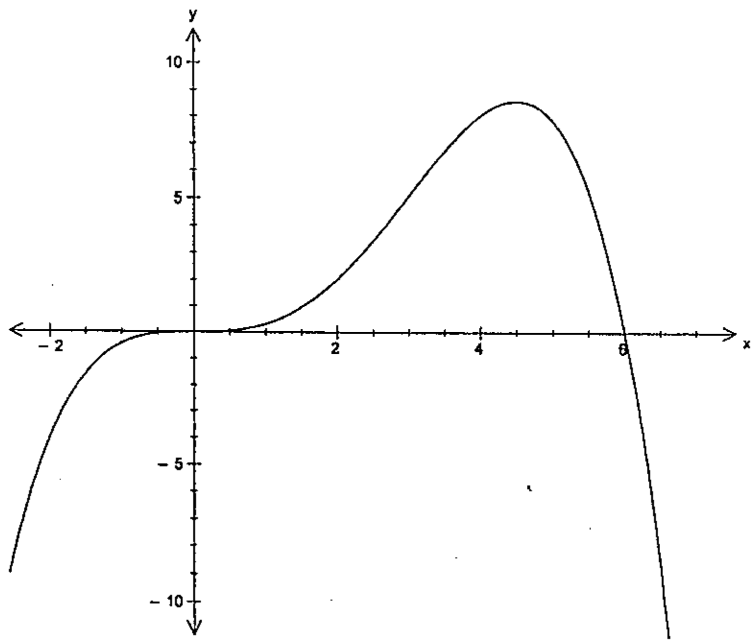
(i) Show that $h=\dfrac{135-r^2}{r}$ **2**

(ii) Show that the volume V is given by $V=\pi r(135-r^2)$ **1**

(iii) Calculate the maximum volume, justifying your answer. **3**

(b) Given that $y=xe^{-2x}$, prove that $\dfrac{d^2y}{dx^2}+4\dfrac{dy}{dx}+4y=0$. **4**

(c) Copy the graph of $y=f(x)$ into your answers.
Sketch the graph of the gradient function. **2**



Question Ten Use a SEPARATE writing booklet.
Marks

(a) (i) Given that $a^2 + b^2 = 23ab$, express $\left(\dfrac{a+b}{5}\right)^2$ in terms of ab. **2**

(ii) Hence show that $\log\left[\dfrac{1}{5}(a+b)\right] = \dfrac{1}{2}(\log a + \log b)$. **2**

(b) Susie borrows \$250 000 to be repaid over a period of 25 years at 6% per annum reducible interest. Each year there are k regular repayments of \$$F$.
Interest is calculated and charged just before each repayment.

(i) Write down an expression for the amount owing after two repayments. **2**

(ii) Show that the amount owing after n repayments is **2**
$$A_n = 250000\alpha^n - \frac{kF(\alpha^n - 1)}{0.06}, \text{ where } \alpha = 1 + \frac{0.06}{k}$$

(iii) Calculate the amount of each repayment if the repayments are made quarterly (ie. $k = 4$). **2**

(iv) How much would Susie have saved over the term of the loan if she had chosen to make monthly rather than quarterly repayments? **2**

KINCOPPAL-ROSE BAY
Cor Unum

2006
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Mathematics SOLUTIONS

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Total marks – 120

- Attempt Questions 1–10
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Question One

(a) Evaluate $\sqrt[3]{\dfrac{315.6}{15.7+21}}=2.05$ (2d.p.) ☑☑ correct to two decimal places

(b) Factorise $8x^3+1=(2x+1)(4x^2-2x+1)$ ☑☑

(c) $\int(2\sin x+x)\,dx=-2\cos x+\dfrac{x^2}{2}+C$ ☑☑

(d) $\dfrac{x-1}{3}-\dfrac{4x-1}{2}=\dfrac{2(x-1)-3(4x-1)}{6}$ ☑

$=\dfrac{-10x+1}{6}$ ☑

(e) If $x^2\le 16$, then $-4\le x\le 4$ ☑☑

(f) For the circle $x^2+(y+1)^2=3$, write down :

(i) the radius = $\sqrt{3}$ ☑

(ii) the centre = (0, -1) ☑

Year 12 2 Unit Mathematics
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Question Two Use a SEPARATE writing booklet.
Marks

(a) $\tan\theta=\dfrac{1}{\sqrt{3}}$ $0\le\theta\le 2\pi$

related angle $=\dfrac{\pi}{6}$ ☑

$\theta=\dfrac{\pi}{6},\pi+\dfrac{\pi}{6}$

$\theta=\dfrac{\pi}{6},\dfrac{7\pi}{6}$ ☑

(b) Differentiate with respect to x:

(i) $y=x^2\cos x$ $u=x^2\to u'=2x$ $v=\cos x\to v'=-\sin x$ ☑

$\dfrac{dy}{dx}=vu'+uv'$

$=2x\cos x-x^2\sin x$ ☑

(ii) $y=\dfrac{x^3}{x+1}$ $u=x^3\to u'=3x^2$ $v=x+1\to v'=1$

$\dfrac{dy}{dx}=\dfrac{vu'-uv'}{v^2}$

$=\dfrac{3x^2(x+1)-x^3}{(x+1)^2}$ ☑

$=\dfrac{2x^3+3x^2}{(x+1)^2}$ ☑

(c) (i) $\int\dfrac{8x^3}{x^4-2}dx=2\int\dfrac{4x^3}{x^4-2}dx$

$=2\ln(x^4-2)+C$ ☑☑

(i) $\int_0^{\frac{\pi}{3}}\sin 2x\,dx=-\left[\dfrac{\cos 2x}{2}\right]_0^{\frac{\pi}{3}}$ ☑

$=-\dfrac{1}{2}\left(\cos\dfrac{2\pi}{3}-\cos 0\right)$

$=0.75$ ☑

(d) Find the equation of the tangent to $y=e^x$ at the point (0,1).

$y=e^x\to\dfrac{dy}{dx}=e^x$ (0,1)

$m=e^0=1$ ☑

$y-1=1(x-0)$

$y=x+1$ ☑

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Question Three Use a SEPARATE writing booklet.
Marks

(a) $\sum_{n=10}^{13}(n^2+1)=100+1+121+1+144+1+169+1=538$ ☑

(b) The sides of a triangle are 10cm, 11cm and 12 cm.

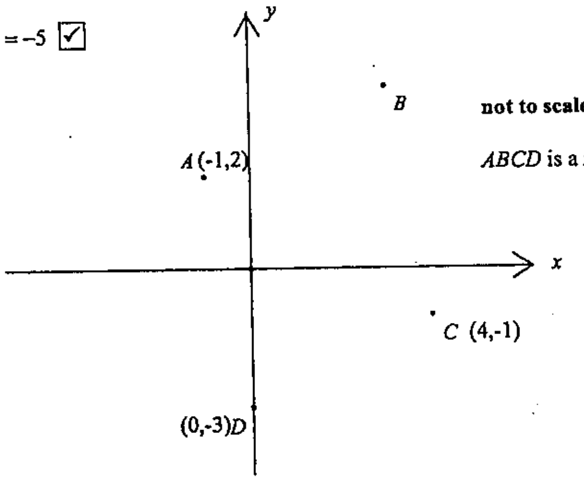
(i) $\cos\theta=\frac{10^2+11^2-12^2}{2\times10\times11}$ ☑

$\cos\theta=\frac{77}{220}$

$\theta=50°5'$ (nearest minute) ☑

(ii) $A=\frac{1}{2}\times10\times11\times\sin 50°5'=42.18\,\text{cm}^2$ (2dp) ☑

(c) (c) (i) $m(AD)=\frac{2--3}{0-1}=-5$ ☑



not to scale

ABCD is a rhoml

(ii) $m=-5$, (0,-3) $\rightarrow y+3=-5(x-0)\rightarrow 5x+y+3=0$ ☑☑

(iii) midpoint of $AC=\left(\frac{-1+4}{2},\frac{2+-1}{2}\right)=\left(\frac{3}{2},\frac{1}{2}\right)$ ☑

(iv) Since this is rhombus the diagonals bisect, so the midpoints of *BC* and *AD* are the same point. Let $B=(x,y)$

$\frac{x+0}{2}=\frac{3}{2}\rightarrow x=3,\ \frac{y+-3}{2}=\frac{1}{2}\rightarrow y=4\ \therefore B=(3,4)$ ☑☑

(v) $BD=\sqrt{(3-0)^2+(4--3)^2}=\sqrt{58}$

Year 12 2 Unit Mathematics
Internal Examination 2006

$\text{Area}=\frac{1}{2}\times\sqrt{58}\times\sqrt{34}=\sqrt{493}\,u^2$ ☑☑

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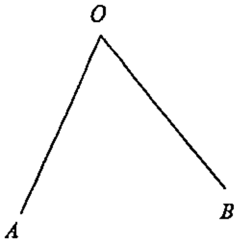
Question Four Use a SEPARATE writing booklet. **Marks**

(a) In the diagram $OA = OB = 1.2$m. The $\angle BOA = 0.7$ radians. O is the centre of the circle. A and B are points on a circle, centred at O.



(i) length of the arc $AB = 1.2 \times 0.7 = 0.84\,cm$ ☑

(ii) Let the straight line distance $AB = d$

$d^2 = 1.2^2 + 1.2^2 - 2 \times 1.2 \times 1.2 \times \cos 0.7$

$d = 0.83\,cm\,(2d.p.)$ ☑☑

(iii) Area of the sector $OAB = \frac{1}{2}1.2^2 \times 0.7 = 0.504\,cm^2$ ☑.

(b) A function $f(x)$ is defined by

(i) $f(x) = (x-2)(x^2-4) = (x-2)(x+2)(x-2) = 0$

$x = 2, x = -2$ ☑☑

(ii) $f(x) = (x-2)(x^2-4) = x^3 - 2x^2 - 4x + 8$

$f'(x) = 3x^2 - 4x - 4$ ☑

$f'(x) = (x-2)(3x+2) = 0$ for stationary points

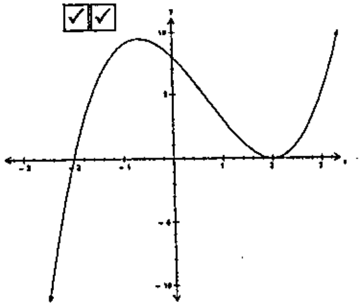
$x = 2, x = -\frac{2}{3}$

$(2,0)$ and $\left(-\frac{2}{3}, \frac{256}{27}\right)$ ☑

$f''(x) = 6x - 4 \to f''(2) = 6 \times 2 - 4 > 0$ concave up, minimum ☑

$f''(x) = 6x - 4 \to f''(-\frac{2}{3}) = 6 \times -\frac{2}{3} - 4 < 0$ concave down, maximum

(iii) ☑☑



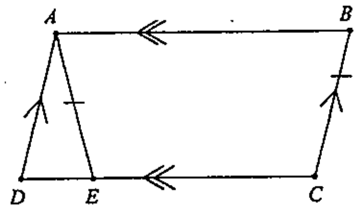
(iv) $f''(x) = 6x - 4 = 0 \to x = \frac{2}{3}$

concave down if $x < \frac{2}{3}$ ☑

Question Five se a SEPARATE writing booklet.
Marks

(a) $\log_5 9 = \frac{\log_{10} 9}{\log_{10} 5} = 1.37$ (2d.p.). ☑☑

(b)



$ABCD$ is a parallelogram and $\angle ABC = 60^\circ$. AE is drawn to meet OD such that $AE = BC$.

(ii) Prove that ΔAED is equilateral

$\angle ADE = 60^\circ$ (opposite angles of a parallelogram are equal) ☑.

$BC = AD$ (opposite sides of a parallelogram are equal)

$BC = AE$ (given)

$AD = AE$ so ΔAED is isosceles and $\therefore \angle ADE = \angle AED = 60^\circ$ ☑

$\angle DAE = 60^\circ$ (angle sum of triangle)

so all angles are equal and ΔAED is equilateral ☑

(c) (i) If $y = \ln(x+1)$, find the gradient function.

$\frac{dy}{dx} = \frac{1}{x+1}$ ☑

(ii) If $y = \frac{1}{2}x + 3$. then the gradient is $\frac{1}{2}$ and if they are parallel then

$\frac{1}{x+1} = \frac{1}{2} \to x = 1$ ☑

if $x = 1$ then $y = \ln 2$ ☑

so the point is $(1, \ln 2)$

(d) (i) Factorise $2a^2 - 7a + 3 = (2a-1)(a-3)$ ☑.

(ii) $2(\log_2 x)^2 - 7\log_2 x + 3 = 0$ let $a = \log_2 x$

$2a^2 - 7a + 3 = 0 \to (2a-1)(a-3) = 0$

$a = \frac{1}{2}, 3$ ☑

$\log_2 x = \frac{1}{2}, \log_2 x = 3$

$x = 2^{\frac{1}{2}}, x = 2^3$

$x = \sqrt{2}, 8$ ☑☑

Question Six Use a SEPARATE writing booklet. **Marks**

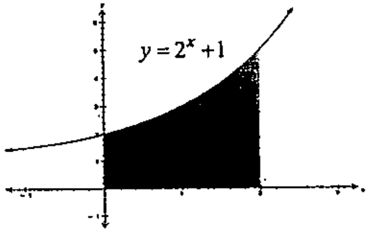
(a) Use Simpson's Rule with 3 function values to find the shaded area. **3**

$$A=\frac{b-a}{6}\left(f(a)+4f\left(\frac{a+b}{2}\right)+f(c)\right)$$

$$A=\frac{2-0}{6}\left(f(0)+4f(1)+f(2)\right) \quad ☑$$

$$A=\frac{1}{3}(2+4\times3+5) \quad ☑$$

$$A=6\frac{1}{3}u^2 \quad ☑$$



(b) The curves $y=x^2$ and $y=8-x^2$ are sketched below

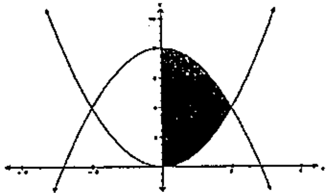
(i) $x^2=8-x^2$

$2x^2=8$

$x^2=4$

$x=\pm2$ ☑

$(2,4)$ and $(-2,4)$ ☑



(ii) $V_1=\int_0^2 x^2dy$

$=\int_0^2 ydy$

$=\left[\frac{y^2}{2}\right]_0^2=2-0=2$

$V_1=\int_0^2 x^2dy$

$=\pi\int_0^2 ydy=\pi\left[\frac{y^2}{2}\right]_0^2=\pi(2-0)=2\pi$ ☑

$V_2=\pi\int_2^4 x^2dy \rightarrow y=8-x^2 \rightarrow x^2=8-y$

$=\pi\int_2^4(8-y)dy=\pi\left[8y-\frac{y^2}{2}\right]_2^4=\pi(32-8-(16-2))=10\pi$ ☑

$V=V_1+V_2=2\pi+10\pi=12\pi u^3$ ☑

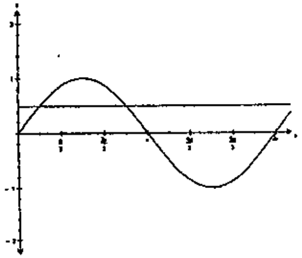
(c) $y=\ln\left(\frac{\sqrt{x-1}}{x^3+5}\right)\rightarrow y=\ln(x-1)^{\frac{1}{2}}-\ln(x^3+5)=\frac{1}{2}\ln(x-1)-\ln(x^3+5)$ ☑

$\frac{dy}{dx}=\frac{1}{2}\times\frac{1}{x-1}+\frac{3x^2}{x^3+5}$

$=\frac{1}{2(x-1)}+\frac{3x^2}{x^3+5}$ ☑☑

Question Seven Use a SEPARATE writing booklet.
Marks

(a) (i) Sketch the graph of $y=\sin x$, for $0\le x\le 2\pi$



(ii) $\sin x=\frac{1}{2}$

related angle $=\frac{\pi}{6}$ ☑

$x=\frac{\pi}{6},\pi-\frac{\pi}{6}$

$x=\frac{\pi}{6},\frac{5\pi}{6}$ ☑

(iii) $0<x<\frac{\pi}{6}$ ☑ and $\frac{5\pi}{6}<x<2\pi$ ☑,

(b) In an arithmetic sequence $T_{10}=35$ and $T_{16}=59$

(i) and (ii) $a+9d=35$ and $a+15d=59$

$a+15d=59$

$\underline{a+9d=35}$

$6d=24$

$d=4\rightarrow a+9(4)=35\rightarrow d=-1$ ☑☑

(iii) $T_{100}=a+99d=-1+99\times4=395$ ☑

(iv) $T_n=-1+(n-1)4>750$

$4n-4>751\rightarrow 4n>755\rightarrow n>\frac{755}{4}\rightarrow n=189$ ☑

(c) A geometric series has a first term of 4 and a limiting sum of 12. Find the common ratio.

$S_\infty=\frac{a}{1-r}$

$12=\frac{4}{1-r}$ ☑

$12(1-r)=4$

$1-r=\frac{1}{3}$

$r=\frac{2}{3}$ ☑☑

Question Eight Use a SEPARATE writing booklet.
Marks

(a) Find the value(s) of m for which the equation $x^2+4mx+8-4m=0$ has equal roots.

Equal roots if $b^2-4ac=0$ ☑

$(4m)^2-4\times1\times(8-4m)=0$

$16m^2-32+16m=0$

$m^2+m-2=0$ ☑

$(m+2)(m-1)=0$

$m=-2,1$ ☑

(b) A graduate earns \$48000 per annum in her first year and then in each successive year her salary rises by \$2400.

(i) What is her salary in the 10^{th} year?

$a=48000, d=2400, T_n=a+(n-1)d$ ☑

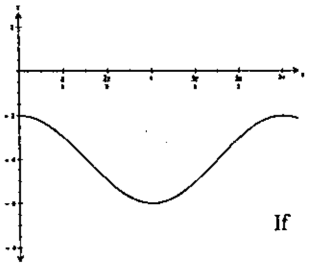
$a=48000, d=2400, T_{10}=48000+9\times2400=\$69600$ ☑

(ii) What are her total earnings over the ten years?

$a=48000, d=2400, S_n=\frac{n}{2}(2a+(n-1)d)$

$S_{10}=5(2\times48000+9\times2400)=\$588000$ ☑

(c) The graph of $A+B\cos Cx$ is given below.



(i) period $=2\pi$ ☑.

(ii) $A=-4$, $B=2$ and $C=1$ ☑☑☑

(d) Over what domain is the function $y=\sqrt{x^2-9}$ defined?

If $y=\sqrt{x^2-9}$ then $x^2-9\ge0\rightarrow x\le-3, x\ge3$ ☑☑

Question Nine Use a SEPARATE writing booklet. **Marks**

(a) A cylindrical can of radius r centimetres and height h centimetres is to be made from a sheet of metal with area 270π square centimetres.

(i) Show that $h=\dfrac{135-r^2}{r}$ 2

$2\pi r^2+2\pi rh=270\pi$ ☑

$r^2+rh=135$

$rh=135-r^2$

$h=\dfrac{135-r^2}{r}$ ☑

(ii) Show that the volume V is given by $V=\pi r(135-r^2)$ 1

$V=\pi r^2h$

$=\pi r^2\dfrac{135-r^2}{r}$

$=\pi r(135-r^2)$ ☑

(iii) Calculate the maximum volume, justifying your answer.

$V=\pi r(135-r^2)$

$=\pi(135r-r^3)$

$\dfrac{dV}{dr}=\pi(135-3r^2)$

$\dfrac{dV}{dr}=0$ for max vol

$135-3r^2=0$

$r^2=45\rightarrow r=3\sqrt5$

$\dfrac{d^2V}{dr^2}=\pi(-6r)<0$

$r=3\sqrt5$ is a max

(b) Given that $y=xe^{-2x}$, prove that $\dfrac{d^2y}{dx^2}+4\dfrac{dy}{dx}+4y=0$.

$y=xe^{-2x}\rightarrow u=x, v=e^{-2x}\rightarrow u'=1, v'=-2e^{-2x}$

$\dfrac{dy}{dx}=e^{-2x}\times1+x\times-2e^{-2x}$

$=(e^{-2x}-2xe^{-2x})$ ☑

$\dfrac{d^2y}{dx^2}=-2e^{-2x}-2(e^{-2x}-2xe^{-2x})$

$=-4e^{-2x}+4xe^{-2x}$ ☑

$\dfrac{d^2y}{dx^2}+4\dfrac{dy}{dx}+4y=-4e^{-2x}+4xe^{-2x}+4(e^{-2x}-2xe^{-2x})+4xe^{-2x}$

$=-4e^{-2x}+4xe^{-2x}+4e^{-2x}-8xe^{-2x}+4xe^{-2x}$

$=0$ ☑☑

Question Ten Use a SEPARATE writing booklet.
Marks

(a) (i) Given that $a^2+b^2=23ab$, express $\left(\frac{a+b}{5}\right)^2$ in terms of ab.

$$\left(\frac{a+b}{5}\right)^2=\frac{a^2+b^2+2ab}{25}$$ ☑

$$=\frac{23ab+2ab}{25}=ab$$ ☑

(ii) Hence show that $\log\left[\frac{1}{5}(a+b)\right]=\frac{1}{2}(\log a+\log b)$. **2**

$$\frac{a+b}{5}=\sqrt{ab}$$

$$\log\left(\frac{a+b}{5}\right)=\frac{1}{2}\log(ab)$$ ☑

$$\log\left(\frac{a+b}{5}\right)=\frac{1}{2}(\log a+\log b)$$ ☑

(b) Susie borrows \$250 000 to be repaid over a period of 25 years at 6% per annum reducible interest. Each year there are k regular repayments of \$$F$.
Interest is calculated and charged just before each repayment.

(i) Write down an expression for the amount owing after two repayments. **2**

$$A_1=250000\times\left(1+\frac{0.06}{k}\right)-F$$ ☑

$$A_2=\left(250000\times\left(1+\frac{0.06}{k}\right)-F\right)\times\left(1+\frac{0.06}{k}\right)-F$$

$$A_2=250000\times\left(1+\frac{0.06}{k}\right)^2-F\times\left(1+\frac{0.06}{k}\right)-F$$

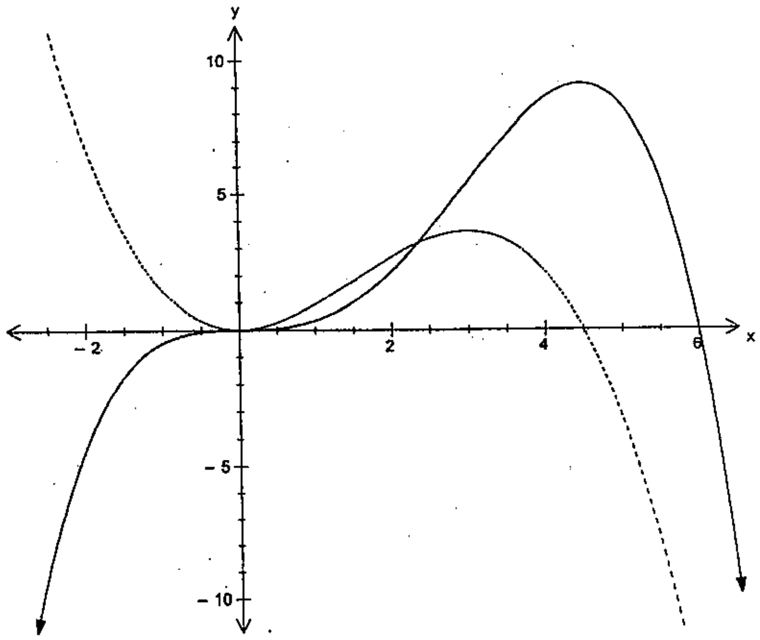
(ii) Show that the amount owing after n repayments is **2**

$$A_n=250000\left(1+\frac{0.06}{k}\right)^n-F\left(1+\left(1+\frac{0.06}{k}\right)+\left(1+\frac{0.06}{k}\right)^2.....\left(1+\frac{0.06}{k}\right)^{n-1}\right)$$ ☑

$$=250000\left(1+\frac{0.06}{k}\right)^n-F\left(\frac{\left(1+\frac{0.06}{k}\right)^n-1}{1+\frac{0.06}{k}-1}\right)$$

$$=250000\alpha^n-F\left(\frac{\alpha^n-1}{\frac{0.06}{k}}\right)=250000\alpha^n-kF\left(\frac{\alpha^n-1}{0.06}\right)$$ ☑

(c) Copy the graph of $y=f(x)$ into your answers.
Sketch the graph of the gradient function. **2**



(iii) Calculate the amount of each repayment if the repayments a... ..ade quarterly (ie. $k = 4$). **2**

$k = 4$ and $n = 100$

$$A_{100} = 250000\left(\frac{1+.06}{4}\right)^{100} - 4F\left(\frac{\left(\frac{1+.06}{4}\right)^{100} - 1}{0.06}\right) = 0$$

(iv) How much would Susie have saved over the term of the loan if she had chosen to make monthly rather than quarterly repayments? **2**