SYDNEY GRAMMAR SCHOOL

2012 Annual Examination

# FORM V
# MATHEMATICS 2 UNIT

Wednesday 29th August 2012

**General Instructions**
- Writing time — 2 hours
- Write using black or blue pen.
- Board-approved calculators and templates may be used.

**Total — 100 Marks**
- All questions may be attempted.

**Section I – 10 Marks**
- Questions 1–10 are of equal value.
- Record your solutions to the multiple choice on the sheet provided.

**Section II – 90 Marks**
- Questions 11–16 are of equal value.
- All necessary working should be shown.
- Start each question in a new booklet.

**Collection**
- Write your name, class and master on each booklet and on your multiple choice answer sheet.
- Hand in the booklets in a single well-ordered pile.
- Hand in a booklet for each question in Section II, even if it has not been attempted.
- If you use a second booklet for a question, place it inside the first.
- Place your multiple choice answer sheet inside the answer booklet for Question Eleven.
- Write your name and master on this question paper and submit it with your answers.

5P: SG 5Q: BDD 5R: RCF

**Checklist**
- SGS booklets — 6 per boy
- Multiple choice answer sheet
- Candidature — 49 boys

Examiner
RCF



**SECTION I - Multiple Choice**

**Answers for this section should be recorded on the separate answer sheet handed out with this examination paper.**

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QUESTION ONE

Which of the following is the derivative of $2x^3 + 2x - 1$?

(A) $6x^2$

(B) $6x^2 + 2$

(C) $6x^3 + 2x$

(D) $6x^2 - 1$

QUESTION TWO

What is the gradient of the interval joining point $A(-2, 4)$ and $B(-5, 0)$?

(A) $-\frac{4}{3}$

(B) $\frac{4}{7}$

(C) $\frac{4}{3}$

(D) $\frac{3}{4}$

QUESTION THREE

Which of the following lines does NOT pass through $(1, -3)$?

(A) $y + 3 = 2(x - 1)$

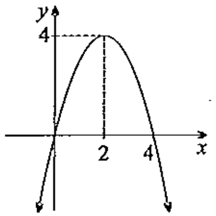
(B) $x = -3$

(C) $x + 2y = -5$

(D) $y = -3x$

**Exam continues next page ...**

QUESTION FOUR




What is the correct equation for the parabola sketched above?

(A) $y = 4 - (x-2)^2$

(B) $y = x^2 + 4$

(C) $y = -(x+2)^2 - 4$

(D) $y = x^2 - 2x - 4$

QUESTION FIVE

Which of the following expressions is equivalent to $\log\left(\dfrac{3x^2}{4}\right)$?

(A) $\log 3 + \log x^2 \div \log 4$

(B) $2(\log 3x - \log 4)$

(C) $2\log x + \log 3 - \log 4$

(D) $3\log x^2 - \log 4$

QUESTION SIX

If the discriminant of a quadratic equation is a square number, which of the following types of roots will the equation have?

(A) Real, rational and distinct roots

(B) Equal real roots

(C) No real roots

(D) Real, irrational and distinct roots

Exam continues overleaf ...



QUESTION SEVEN

Given the sequence $5, 7, 9, 11, \ldots$, which of the following statements is INCORRECT?

(A) $S_5 = 45$

(B) The common difference is 2.

(C) $S_n = \frac{n}{2}(8 + 2n)$

(D) The $n$th term is $5 \times 2^{n-1}$

QUESTION EIGHT

Given a geometric progression with first term 5 and common ratio 2, the sum of the first ten terms is:

(A) $\dfrac{2(5^{10} - 1)}{4}$

(B) 140

(C) $5(1 - 2^{10})$

(D) $5(2^{10} - 1)$

QUESTION NINE

The solutions of the equation $2x^2 - 6x + 3 = 0$ are:

(A) $x = \dfrac{3 + \sqrt{3}}{2}$ and $x = \dfrac{3 - \sqrt{3}}{2}$

(B) $x = 1$ and $x = \dfrac{3}{2}$

(C) $x = \dfrac{-6 + \sqrt{12}}{4}$ and $x = \dfrac{-6 - \sqrt{12}}{4}$

(D) There are no real solutions

Exam continues next page ...

QUESTION TEN

Which expression is equivalent to $2\sin^2\theta + 1$?

(A) $1 + 2\cos^2\theta$

(B) $3 - 2\cos^2\theta$

(C) $2\cos^2\theta - 1$

(D) $2\cos^2\theta + 3$

End of Section I

**Exam continues overleaf ...**



SECTION II - Written Response

**Answers for this section should be recorded in the booklets provided.**

**Show all necessary working.**

**Start a new booklet for each question.**

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QUESTION ELEVEN (15 marks) Use a separate writing booklet. **Marks**

(a) Simplify $2x^3 \times (-3x^5)$. [1]

(b) Expand $(2x-1)^2$. [1]

(c) Evaluate, leaving your answers in exact form:

(i) $2\sqrt{72} - 3\sqrt{8}$ [1]

(ii) $\sin 60^\circ + \sin 90^\circ$ [1]

(iii) $\dfrac{10(3^4-1)}{3-1}$ [1]

(iv) $\log_2 32$ [1]

(d) Differentiate the following:

(i) $3x^5$ [1]

(ii) $\sqrt{x}$ [1]

(iii) $\dfrac{1}{3x^2}$ [2]

(e) Solve:

(i) $(2x-3)(3x+5) = 0$ [1]

(ii) $\tan\theta = \sqrt{3}$, for $0^\circ \le \theta \le 360^\circ$ [1]

(iii) $\log_3 x = 4$ [1]

(iv) $2^{x+3} = \sqrt{32}$ [2]

**Exam continues next page ...**

**QUESTION TWELVE** (15 marks) Use a separate writing booklet. **Marks**

(a) Consider the arithmetic sequence $15, 18, 21, \ldots$.

(i) State the values of $a$ and $d$. [1]

(ii) Find the one hundredth term. [1]

(iii) Find the sum of the first one hundred terms. [2]

(b) Consider the parabola with equation $y = x^2 - 6x + 5$.

(i) State the $y$-intercept. [1]

(ii) Find the $x$-intercepts. [2]

(iii) State the equation of the axis of symmetry. [1]

(iv) Hence find the co-ordinates of the vertex. [1]

(v) State the minimum value of $x^2 - 6x + 5$. [1]

(vi) Sketch the graph of $y = x^2 - 6x + 5$, clearly marking all of the above features. [2]

(vii) Hence solve the inequation $x^2 - 6x + 5 \geq 0$. [1]

(c) Find the limiting sum of the geometric series $1 + \frac{1}{3} + \frac{1}{9} + \frac{1}{27} \cdots$. [2]

Exam continues overleaf ...



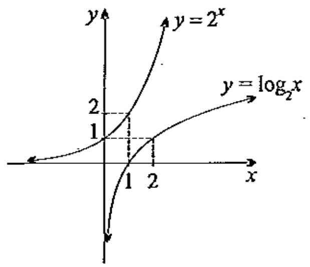
**QUESTION THIRTEEN** (15 marks) Use a separate writing booklet. **Marks**

(a) Differentiate the following, without using the product or quotient rules:

(i) $f(x) = x^2(2x^4 - 5x)$ [2]

(ii) $f(x) = \dfrac{x+1}{\sqrt{x}}$ [2]

(b)




The diagram above shows the graphs of $y = 2^x$ and $y = \log_2 x$.

(i) Sketch the graph of $y = 2^{-x}$, showing clearly any intercepts. [1]

(ii) On a separate set of axes, sketch the graph of $y = \log_2(x - 1)$, showing clearly any intercepts and asymptotes. [2]

(iii) State the domain for $y = \log_2(x - 1)$. [1]

(c) Find the equation of the tangent to the parabola $y = x^2 - 6x + 5$ at the point $(4, -3)$. Give your answer in general form. [3]

(d) A cricket ball is hit skywards so that at any time $t$ seconds after leaving the bat, the height of the ball is given by $h = 35t - 5t^2$ metres.

(i) Find the time at which the ball reaches its maximum height. [1]

(ii) Hence determine the maximum height attained. [1]

(e) Find the natural domain of $f(x) = \sqrt{9 - x}$. [2]

Exam continues next page ...

**QUESTION FOURTEEN** (15 marks) Use a separate writing booklet. **Marks**

(a) Use the chain rule to differentiate:

(i) $y = (3x^2 + 5)^4$ [2]

(ii) $y = \sqrt{3 - 2x}$ [2]

(b) If $\alpha$ and $\beta$ are the roots of the equation $2x^2 - 4x + 3 = 0$, find:

(i) $\alpha + \beta$ [1]

(ii) $\alpha\beta$ [1]

(iii) $\dfrac{2}{\alpha} + \dfrac{2}{\beta}$ [2]

(iv) $\alpha^2 + \beta^2$ [2]

(c) Consider the quadratic function $f(x) = x^2 + 4x - 3$.

(i) Complete the square. [2]

(ii) Hence, or otherwise, find the minimum value of the function. [1]

(d) Prove the identity $\dfrac{\sin\beta}{\cos\beta} + \dfrac{\cos\beta}{\sin\beta} = \sec\beta\,\mathrm{cosec}\,\beta$. [2]

Exam continues overleaf ...



**QUESTION FIFTEEN** (15 marks) Use a separate writing booklet. **Marks**

(a) Differentiate $f(x) = x^2 - 5x$ from first principles. [3]

(b) An arithmetic sequence has first term 8 and sixth term 28.

(i) Find the common difference. [1]

(ii) Find the first term larger than one hundred. [2]

(iii) Find the value of $n$ for which $S_n = 680$. [3]

(c) Use the quotient rule to differentiate $f(x) = \dfrac{5x + 3}{3x - 4}$. [3]

(d) Use the product rule to differentiate $f(x) = 2x^4(3x + 1)^3$, expressing the derivative in fully factorised form. [3]

Exam continues next page ...

**QUESTION SIXTEEN** (15 marks) Use a separate writing booklet. **Marks**

(a) Solve $3 \times 2^x = 5775$. Give your answer correct to two decimal places. [2]

(b) A yacht sails 30 km from harbour $A$ to island $B$ on a bearing of 053°, then it sails 110 km from island $B$ to marina $C$ on a bearing of 285°.

(i) Draw a clearly labelled diagram to represent this voyage. [1]

(ii) Find the distance of harbour $A$ from marina $C$, correct to the nearest kilometre. [2]

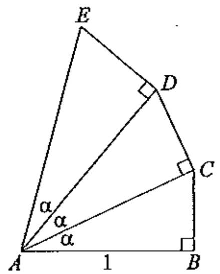
(iii) Find $\angle ACB$, and hence find the bearing of harbour $A$ from marina $C$, correct to the nearest degree. [2]

(c) Consider the quadratic function $f(x) = kx^2 - 8x + 4k$.

(i) Find the values of $k$ for which the function has a repeated zero. [2]

(ii) Find the values of $k$ for which the function has no real zeroes. [2]

(d)




In the diagram above, the spiral begins with right-angled triangle $ABC$ in which $AB = 1$m and $\angle CAB = \alpha$, where $\alpha < 30°$. A similar right-angled triangle $ACD$ is drawn on the hypotenuse $AC$. This pattern is then continued to form triangles $ADE$, $AEF$ and so on.

(i) Show that $CD = \sec\alpha \tan\alpha$. [2]

(ii) Find an expression for side $DE$. [1]

(iii) The spiral pattern is continued until the tenth triangle $AKL$ is formed. Find an expression for side $KL$ of this triangle. [1]

——— End of Section II ———

END OF EXAMINATION

Tear-off pages follow ...

# FIFTH FORM 2U ANNUAL 2012

## Section 1 Multi-Choice One Mark Each

① $f(x) = 2x^3 + 2x - 1$

$f'(x) = 6x^2 + 2$ (B)

② $m = \frac{0-4}{-5-(-2)} = \frac{-4}{-3} = \frac{4}{3}$ (C)

③ (B)

④ (A) Vertex $(2,4)$ $y-4 = -(x-2)^2$

Concave Down $a = (-1)$

⑤ $\log\left(\frac{3x^2}{4}\right) = \log 3x^2 - \log 4$

$= \log 3 + \log x^2 - \log 4$

$= \log 3 + 2\log x - \log 4$

(C)

⑥ $\Delta$ a positive square

Real distinct rational roots (A)

⑦ AP $a = 5$, $d = 2$

(D) General term of GP not AP!

Note! $S_5 = \frac{5}{2}(2\times5 + 4\times2)$

$= 5\times9$

$= 45$ ✓

$S_n = \frac{n}{2}(2\times5 + (n-1)\times2)$

$= \frac{n}{2}(8 + 2n)$ ✓

⑧ GP $a = 5$ $r = 2$

$S_{10} = \frac{a(r^{10}-1)}{r-1}$

$= \frac{5(2^{10}-1)}{2-1}$

$= 5(2^{10}-1)$ (D)

⑨ $2x^2 - 6x + 3 = 0$

$a = 2$ $b = (-6)$ $c = 3$

$x = \frac{6 \pm \sqrt{6^2 - 4\times2\times3}}{2\times2}$

$= \frac{6 \pm \sqrt{12}}{4}$

$= \frac{3 \pm \sqrt{3}}{2}$ (A)

⑩ $2\sin^2\theta + 1 = 2(1-\cos^2\theta) + 1$

$= 3 - 2\cos^2\theta$

(B)

SUMMARY

① B
② C
③ B
④ A
⑤ C
⑥ A
⑦ D
⑧ D
⑨ A
⑩ B

## Question 11

a) $2x^3 \times (-3x^5) = -6x^8$ ✓

b) $(2x-1)^2 = 4x^2 - 4x + 1$ ✓

c) (i) $2\sqrt{72} - 3\sqrt{8} = 12\sqrt{2} - 6\sqrt{2}$

$= 6\sqrt{2}$ ✓

(ii) $\sin 60° + \sin 90° = \frac{\sqrt{3}}{2} + 1$ OR $\left(\frac{\sqrt{3}+2}{2}\right)$ ✓

(iii) $\frac{10(3^4-1)}{3-1} = 5(81-1)$

$= 400$ ✓

(iv) $\log_2 32 = 5$ (since $2^5 = 32$) ✓

d) (i) $y = 3x^5$

$\frac{dy}{dx} = 15x^4$ ✓

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

$\frac{dy}{dx} = \frac{1}{2}x^{-\frac{1}{2}}$ ✓

(or $\frac{1}{2\sqrt{x}}$)

(ii) $y = \frac{1}{3}x^{-2}$ ✓

$\frac{dy}{dx} = -\frac{2}{3}x^{-3}$ ✓

(or $\frac{-2}{3x^3}$)

e) (i) $(2x-3)(3x+5) = 0$

$x = \frac{3}{2}$ OR $x = \left(-\frac{5}{3}\right)$ ✓

(ii) $\tan\theta = \sqrt{3}$

$\theta = 60°$ OR $240°$ ✓

(iii) $\log_3 x = 4$

$x = 3^4$

$= 81$ ✓

(iv) $2^{x+3} = \sqrt{32}$

$2^{x+3} = 32^{\frac{1}{2}}$

$2^{x+3} = (2^5)^{\frac{1}{2}}$ ✓

$x + 3 = \frac{5}{2}$

$x = \left(-\frac{1}{2}\right)$ ✓

## QUESTION TWELVE

a) AP 15, 18, 21...

(i) $a = 15 \quad d = 3$ ✓

(ii) $t_{100} = a + 99d$
$= 15 + 99 \times 3$
$= 15 + 297$
$= 312$ ✓

(iii) $S_{n100} = \frac{n}{2}(2a + (n-1)d)$
$S_{100} = 50(30 + 99 \times 3)$ ✓
$= 50 \times 327$
$= 100 \times 163.5$
$= 16350$ ✓

b) $y = x^2 - 6x + 5$ ✓

(i) $(0, 5)$

(ii) $y = (x-5)(x-1)$ ✓
$(1,0)$ and $(5,0)$ ✓

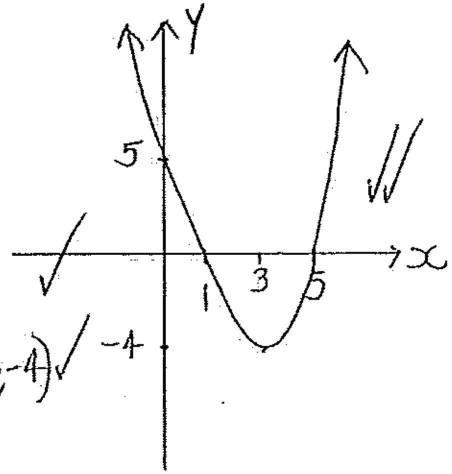
(iii) $x = 3$ ✓

(iv) $y = 3^2 - 6 \times 3 + 5 = 9 - 18 + 5 \quad V(3,-4)$ ✓

(v) Min Value $= (-4)$ ✓

(vi) $x^2 - 6x + 5 \geq 0$
$x \geq 5$ OR $x \leq 1$ ✓

(vi)



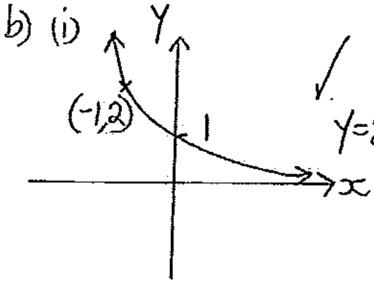

c) GP $a = 1 \quad r = \frac{1}{3}$
$S_\infty = \frac{a}{1-r} = \frac{1}{1-\frac{1}{3}}$ ✓
$= \frac{1}{2/3}$
$= 3/2$ ✓

## QUESTION 13

a) (i) $f(x) = x^2(2x^4 - 5x)$ ✓
$= 2x^6 - 5x^3$ ✓
$f'(x) = 12x^5 - 15x^2$ ✓

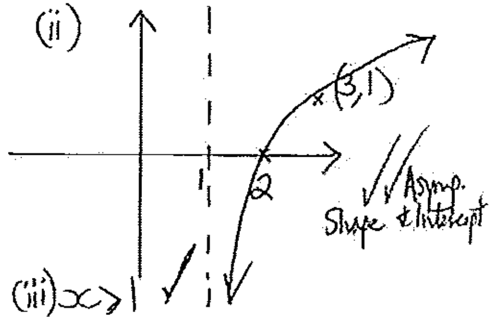
(ii) $f(x) = \frac{x+1}{\sqrt{x}}$
$= \sqrt{x} + \frac{1}{\sqrt{x}}$
$= x^{\frac{1}{2}} + x^{-\frac{1}{2}}$ ✓
$f'(x) = \frac{1}{2}x^{-\frac{1}{2}} - \frac{1}{2}x^{-\frac{3}{2}}$ ✓

b) (i)




✓ $y = 2^{-x}$

(ii)




✓✓✓ Asymp. Shape & Intercept

(iii) $x > 1$ ✓

c) $y = x^2 - 6x + 5$
$\frac{dy}{dx} = 2x - 6$
$\left(\frac{dy}{dx}\right)_{x=4} = 8 - 6 = 2$ ✓
Eqn of tangent $y + 3 = 2(x - 4)$ ✓
$0 = 2x - y - 11$ ✓

d) $h = 35t - 5t^2$
$h = 5t(7 - t)$
Zeroes $t = 0 \quad t = 7$
∴ Maximum @ $t = \frac{7}{2}$ seconds ✓

(ii) Max $h = 5 \times \frac{7}{2} \times \frac{7}{2}$
$= \frac{245}{4}$ metres
$= 61\frac{1}{4}$ metres ✓

e) $f(x) = \sqrt{9 - x}$ ✓
$9 - x \geq 0$ ✓
$9 \geq x$ ✓
$x \leq 9$

QUESTION 14

a) (i) $y = (3x^2+5)^4$

Let $u = 3x^2+5 \quad y = u^4$

$\frac{du}{dx} = 6x \quad \frac{dy}{du} = 4u^3$ ✓

$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$

$= 4(3x^2+5)^3 \times 6x$ ✓

$= 24x(3x^2+5)^3$

(ii) $y = (3-2x)^{\frac{1}{2}}$

$u = 3-2x \quad y = u^{\frac{1}{2}}$

$\frac{du}{dx} = (-2) \quad \frac{dy}{du} = \frac{1}{2}u^{-\frac{1}{2}}$ ✓

$\frac{dy}{dx} = \frac{1}{2}(3-2x)^{-\frac{1}{2}} \times (-2)$

$= \frac{-1}{\sqrt{3-2x}}$ ✓

b) $2x^2 - 4x + 3 = 0$

$a=2 \quad b=-4 \quad c=3$

(i) $\alpha+\beta = -\frac{b}{a} = \frac{4}{2}$ ✓

$= 2$

(ii) $\alpha\beta = \frac{c}{a} = \frac{3}{2}$ ✓

(iii) $\frac{2}{\alpha} + \frac{2}{\beta} = \frac{2(\alpha+\beta)}{\alpha\beta}$ ✓

$= \frac{2\times 2}{3/2}$

$= 4 \times \frac{2}{3}$

$= 8/3$ ✓

(iv) $\alpha^2+\beta^2 = (\alpha+\beta)^2 - 2\alpha\beta$ ✓

$= 2^2 - 2\left(\frac{3}{2}\right)$

$= 4-3$

$= 1$ ✓

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

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

$= (x+2)^2 - 7$ ✓✓ complt. square

(ii) Minimum is $(-7)$ ✓

d) $LHS = \frac{\sin\beta}{\cos\beta} + \frac{\cos\beta}{\sin\beta}$ ✓

$= \frac{\sin^2\beta}{\sin\beta\cos\beta} + \frac{\cos^2\beta}{\sin\beta\cos\beta}$ ✓

$= \frac{\sin^2\beta + \cos^2\beta}{\sin\beta\cos\beta}$

$= \frac{1}{\sin\beta\cos\beta}$ ✓

$= \sec\beta\,\mathrm{cosec}\,\beta$

$= RHS$

QUESTION 15

a) $f(x) = x^2 - 5x$

$f'(x) = \lim_{h\to 0}\left[\frac{\{(x+h)^2 - 5(x+h)\} - (x^2-5x)}{(x+h)-x}\right]$ ✓

$= \lim_{h\to 0}\left[\frac{x^2+2xh+h^2-5x-5h-x^2+5x}{h}\right]$ ✓

$= \lim_{h\to 0}\left[\frac{h^2+2xh-5h}{h}\right]$

$= \lim_{h\to 0}\left[\frac{h(2x-5+h)}{h}\right]$ ✓

$= \lim_{h\to 0}(2x-5+h)$

$= 2x-5$

b) AP $\quad a=8 \quad t_6 = 28 = a+5d$

(i) $\therefore 5d = 20$

$d = 4$ ✓

(ii) $t_n = a+(n-1)d$

$= 8+4(n-1)$

$= 4+4n$

We require $t_n > 100$ ✓

$4+4n > 100$ ✓

$4n > 96$

$n > 24$

Twenty fifth term ✓ $t_{25} = 104$

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

$= \frac{n}{2}(16+4n-4)$

$= \frac{n}{2}(12+4n)$ ✓

$= 6n+2n^2$ ✓

We require $S_n = 680$ ✓

$680 = 6n+2n^2$ ✓

$n^2+3n-340 = 0$

$(n+20)(n-17) = 0$

$n = 17 \quad$ since $n > 0$ ✓

$\therefore S_{17} = 680$

c) $f(x) = \frac{5x+3}{3x-4}$ $\quad u = 5x+3 \quad \frac{du}{dx} = 5 \quad v = 3x-4 \quad \frac{dv}{dx} = 3$

$f'(x) = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$ ✓

$= \frac{5(3x-4) - 3(5x+3)}{(3x-4)^2}$ ✓ $= \frac{-29}{(3x-4)^2}$ ✓

d) $f(x) = 2x^4(3x+1)^3$

$u = 2x^4 \quad v = (3x+1)^3$

$\frac{du}{dx} = 8x^3 \quad \frac{dv}{dx} = 3(3x+1)^2 \times 3$

$= 9(3x+1)^2$ ✓

$\frac{dy}{dx} = v\frac{du}{dx} + u\frac{dv}{dx}$

$= 8x^3(3x+1)^3 + 2x^4 \times 9(3x+1)^2$ ✓

$= 8x^3(3x+1)^3 + 18x^4(3x+1)^2$

$= 2x^3(3x+1)^2\left[4(3x+1) + 9x\right]$

$f'(x) = 2x^3(3x+1)^2(21x+4)$ ✓

If error $\frac{dv}{dx} = 3(3x+1)^2$

then $\frac{dy}{dx} = 2x^3(3x+1)^2(15x+4)$ (2 marks awarded)

## QUESTION 16

a) $3 \times 2^x = 5775$

$(\div 3) \quad (\div 3)$

$2^x = 1925$ ✓

$\log_{10} 2^x = \log_{10} 1925$ ✓

$x \times \log 2 = \log 1925$

$x = \frac{\log 1925}{\log 2}$

$\doteqdot 10.9106\ldots$ ✓

$\doteqdot 10.91$ (2dp)

c) $f(x) = kx^2 - 8x + 4k$

$\Delta = (-8)^2 - 4 \times k \times 4k$

$= 64 - 16k^2$

$= 16(4 - k^2)$ ✓

(i) Repeated Zero

$\Delta = 0$

$4 - k^2 = 0$

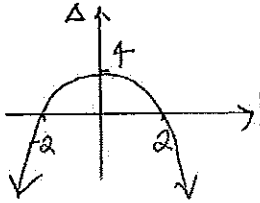
$(2-k)(2+k) = 0$ ✓

$k = 2$ OR $(-2)$ ✓

(ii) No Real Zeroes

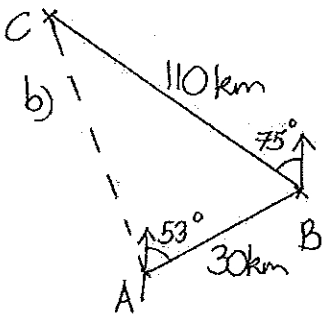
$\Delta < 0$

$4 - k^2 < 0$ ✓



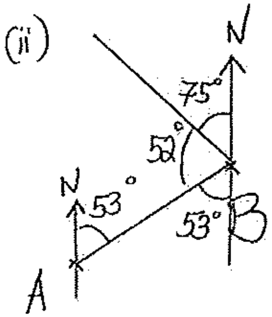

$k > 2$ OR $k < (-2)$ ✓

b)




✓

(ii)




Angle ABC $= 52°$ ✓

Using cosine rule in $\triangle ABC$

$AC^2 = 30^2 + 110^2 - 2 \times 30 \times 110 \times \cos 52$

$= 900 + 12100 - 6600 \cos 52$

$= 8936.63\ldots$

$AC \doteqdot 94.53\ldots$

AC is approx 95 km ✓

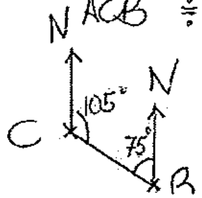
(iii) Using sine rule in $\triangle ABC$

$\frac{\sin A\hat{C}B}{30} = \frac{\sin 52°}{AC}$

$\sin A\hat{C}B = \frac{30 \times \sin 52°}{94.53\ldots}$

$= 0.250\ldots$

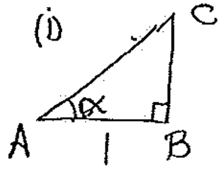
$A\hat{C}B \doteqdot 14°29'$ ✓




Bearing of A from C is $105 + 14°29'$

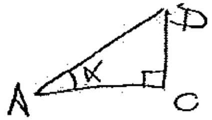
approx 120° ✓

d) (i)




$\cos\alpha = \frac{AB}{AC}$

$\therefore AC = \frac{1}{\cos\alpha} = \sec\alpha$ ✓

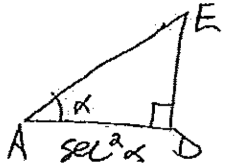



$\tan\alpha = \frac{CD}{AC}$

$CD = AC\tan\alpha$

$= \sec\alpha\tan\alpha$ ✓

(ii) $\cos\alpha = \frac{AC}{AD}$ $\therefore$ $AD = AC\sec\alpha = \sec^2\alpha$




$\tan\alpha = \frac{DE}{\sec^2\alpha}$

$DE = \tan\alpha\sec^2\alpha$ ✓

(iii) $BC = \tan\alpha$

$CD = \tan\alpha\sec\alpha$

$DE = \tan\alpha\sec^2\alpha$

GP $a = \tan\alpha$ $r = \sec\alpha$

$KL = t_{10} = ar^9$

$= \tan\alpha\sec^9\alpha$ ✓