Question 1 (14 marks) Start a New Booklet

(a) Find the value of $19^{-0.7}$ correct to two decimal places. **2**

(b) Find the integers a and b such that $(5-\sqrt{2})^2 = a + b\sqrt{2}$. **2**

(c) Express $0.\dot{3}\dot{6}$ as a fraction in its simplest form. **2**

(d) Simplify $\dfrac{x}{3}+\dfrac{3x-1}{2}$ **2**

(e) Simplify $\dfrac{(3xy^3)^3}{3x^2y^4}$ **2**

(f) Factorise completely

(i) $3x^3+24$ **2**

(ii) x^4-y^4 **2**

Question 2 (19 marks) Start a New Booklet

(a) Solve simultaneously $\begin{array}{l} x+y=1 \\ 2x-y=5 \end{array}$ **2**

(b) Solve $-4 \le 2x-3 \le 7$ and graph your solution on the number line. **2**

(c) Given that $f(x)=\begin{cases} x+2 & if\ x<-1 \\ 1 & if\ -1\le x\le 3 \\ x-2 & if\ x>3 \end{cases}$ find $f(\text{-}2)+f(3)$. **2**

(d) Given the function $y=\sqrt{25-x^2}$, state its domain and range. **2**

(e) Sketch, showing all essential features **4**

(i) $y=|x+2|$

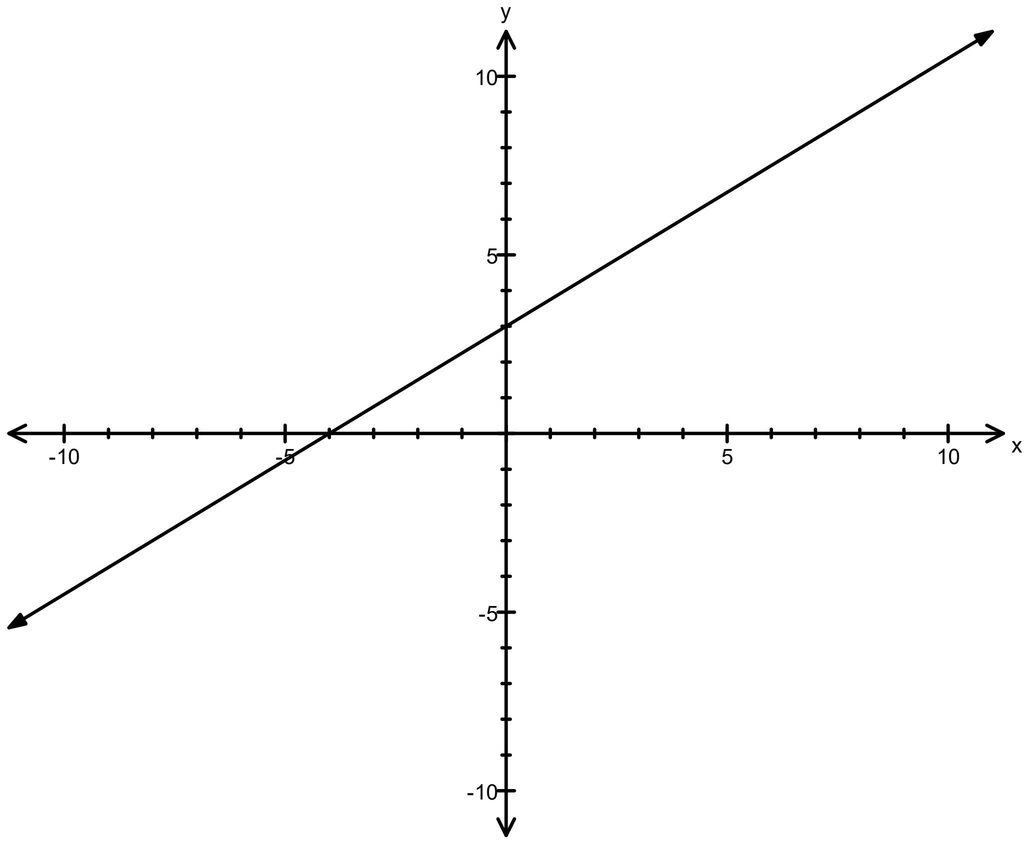
(ii) $y=\dfrac{1}{x+2}+1$

(f) Sketch the parabola $y=x^2-x-6$ indicating the x and y intercepts and vertex. **4**

(g) Solve, $3x^2+4x-1=0$, leaving your answer in simplest form. **3**

Question 3 (14 marks) Start a New Booklet

(a) The line l cuts the x-axis at M (-4, 0) and the y-axis at N (0, 3) as shown. P is a point on the line l, and Q is the point (0, 8).



(i) Copy the diagram into your writing paper, clearly marking the given coordinates.

(ii) Find the equation of the line l. **2**

(iii) Find the acute angle the line l makes with the x positive axis. **1**

(iii) Show that the point (16, 15) lies on the line l. **1**

(iv) Show that ΔMNQ is isosceles. **2**

(v) Calculate the gradient of the line QM. **1**

(vi) N is the midpoint of the interval MP. Find the coordinates of the point P. **2**

(vii) Show that $\angle PQM$ is a right angle. **1**

(viii) Find the area of ΔPQM. **2**

Question 3 cont.....

(b) Find the perpendicular distance from the point (4, 5) to the line with the equation $5x - 12y - 4 = 0$. **2**

Question 4 (16 marks) Start a New Booklet

(a) Solve $2\cos\theta + 1 = 0$ for $0° \le \theta \le 360°$. **2**

(b) Simplify $1 - \dfrac{\sin A \cos A}{\tan A}$. **3**

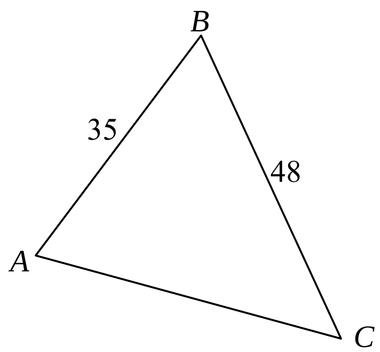
(c) In triangle *ABC*, *BC* = 11cm, *AC* = 5cm and *AB* = 8cm.

(i) Draw a diagram to show this information.

(ii) Calculate the size of angle ABC, correct to the nearest degree. **2**

(iii) Calculate the area of the triangle (to nearest cm^2) **2**

(d) Three boys are standing on the school oval. *A* is 35 metres from *B* and *B* is 48 metres from *C*.
The bearing of *B* from *A* is $036°$T and the bearing of *C* from *B* is $156°$T.



(i) Copy the diagram into your answer booklet showing all information given above. **1**

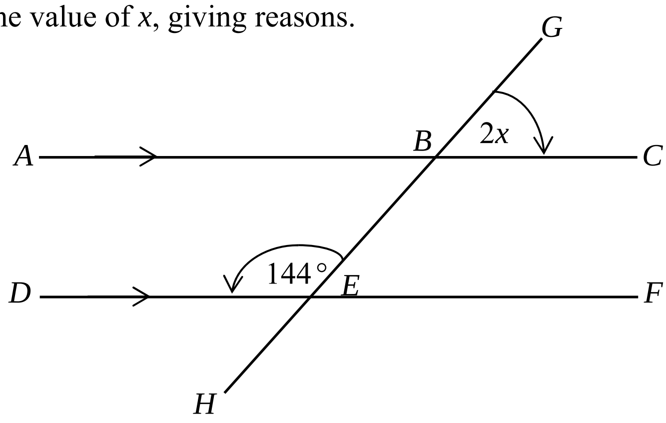
(ii) Show that $\angle ABC = 60°$. **1**

(iii) Find the distance of *C* from *A*, correct to the nearest metre. **2**

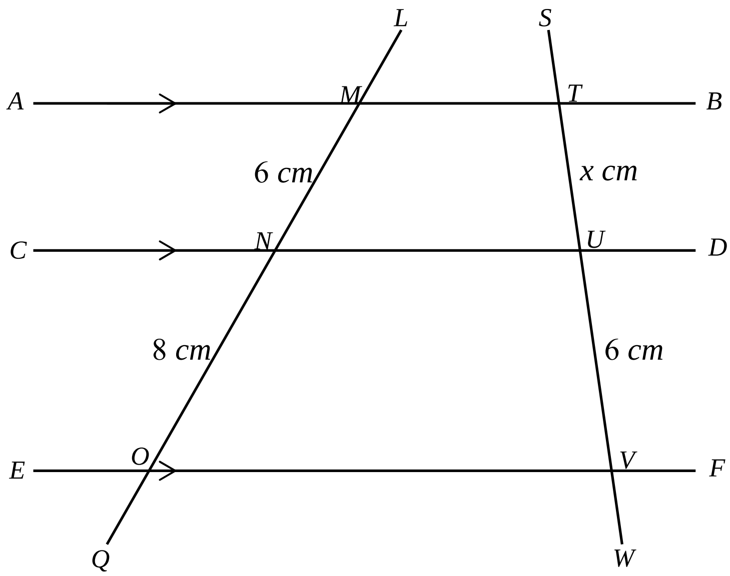
(iv) Find the bearing of *A* from *C*, correct to the nearest degree. **3**

Question 5 (13 marks) Start a New Booklet

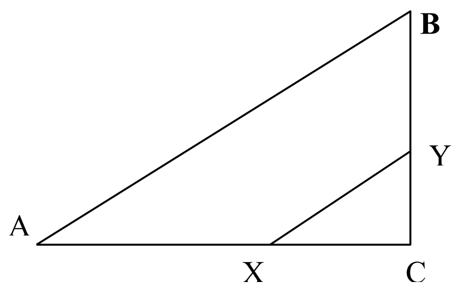
a) Find the value of x, giving reasons. **2**



(b) Find the value of x, give reasons to justify your answer. **2**



(c) In the figure XY is parallel to AB.
$AB = 60$ mm
$XY = 20$ mm
$BY = 30$ mm

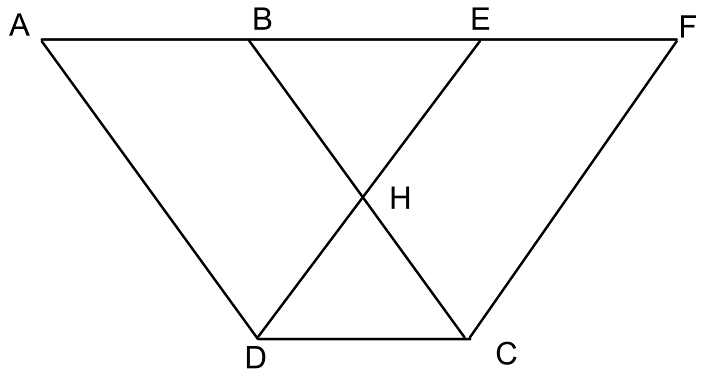


(i) Show that ΔABC is similar to ΔXYC. **2**

(ii) Calculate the length of CY. **2**

Question 5 cont….

(d)



A, B, E and F are collinear points. ABCD and EFCD are parallelograms. BC and ED intersect at H such that H is the mid-point of BC.
Copy or trace the diagram onto your worksheet.

(i) Prove that $\Delta BHE \equiv \Delta CHD$. **3**

(ii) Explain why DC = BE.
1

(iii) Hence or otherwise, show that AF = 3DC. **1**

Question 6: (14 marks) Start a New Booklet

Differentiate the following, with respect to *x*

(i) $4x^3 - 6x + 7$ **1**

(ii) $\dfrac{2}{x^3}$ **2**

(iii) $x\sqrt{x}$ **2**

(iv) $5x(2x-1)^2$ **2**

(v) $(4x^3 - 7)^5$ **2**

(vi) $\dfrac{4x^2 - 2}{x+3}$ **2**

(vii) $x\sqrt{x+3}$, answer in its simplest form. **3**

END OF THE PAPER

Q1 2 UNIT

a) $19^{-0.7} = 0.127\ldots$ (1 mark) (calc)

$= 0.13$ (2)

b) $(5-\sqrt{2})^2 = 25 - 10\sqrt{2} + 2$

$= 27 - 10\sqrt{2}$ (1 mark) (2)

$\therefore a = 27,\ b = -10$

c) $0.\dot{3}\dot{6} = \frac{36}{99}$ (1 mark)

$= \frac{4}{11}$ (2)

d) $\frac{x}{3} + \frac{3x-1}{2}$

$= \frac{2x + 3(3x-1)}{6}$ (1 mark)

$= \frac{2x + 9x - 3}{6}$

$= \frac{11x - 3}{6}$ (2)

e) $\frac{(3xy^3)^3}{3x^2y^4} = \frac{27x^3y^9}{3x^2y^4}$

$= 9xy^5$ (2)

f) i) $3x^3 + 24$

$= 3(x^3 + 8)$ (1 mark)

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

ii) $x^4 - y^4$

$= (x^2 - y^2)(x^2 + y^2)$ (1 mark)

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

Preliminary Examination

2unit Year 11 2010

Question 2

1) 1. $x+y=1$ — ①

$2x-y=5$ — ②

①+② $3x=6$

$\therefore x=2$ ✓

Sub in ① $2+y=1$

$y=-1$

2 marks

Check in ② $4-(-1)=5$ ✓

$\therefore \left.\begin{matrix} x=2 \\ y=-1 \end{matrix}\right\}$ is the solution. ✓

(2 marks).

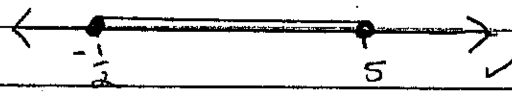
b) $-4 \leq 2x-3 \leq 7$

2 marks

$-1 \leq 2x \leq 10$

$-\frac{1}{2} \leq x \leq 5$ ✓

Solutions should be connected to number line



(2marks)

c) $\left.\begin{matrix} f(-2)=0 \\ f(3)=1 \end{matrix}\right\}$ 1 mark for one of these ✓

2 marks

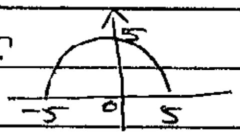
$\therefore f(-2)+f(3) = 0+1$

$= 1$ ✓

(2 marks)

sketch

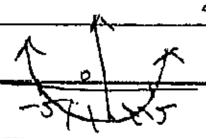
d) $y=\sqrt{25-x^2}$



Domain: $25-x^2 \geq 0$

$(5-x)(5+x) \geq 0$

2 marks



Domain & Range must be named accordingly.

Domain $-5 \leq x \leq 5$ ✓

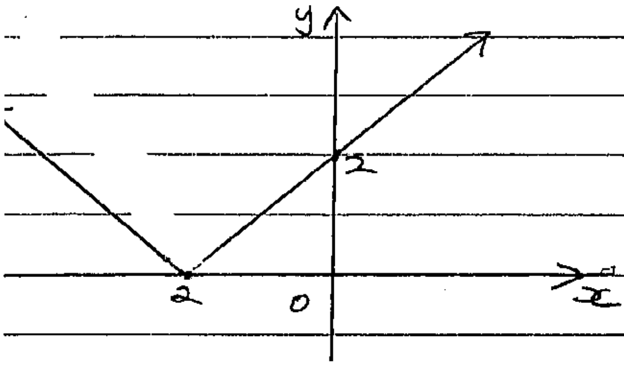
Range: $0 \leq y \leq 5$ ✓

(2 marks)

Preliminary Examination

2unit Year11 2010.

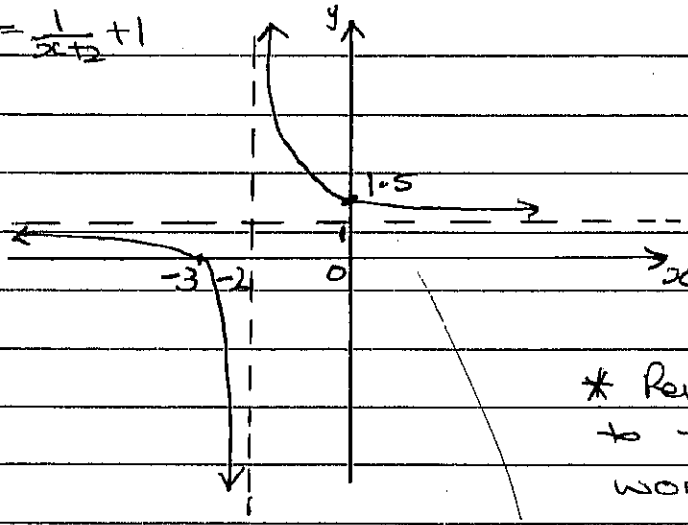
(e)(i) $y = |x+2|$



1 mark both intercepts.
1 mark shape.

2 marks

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

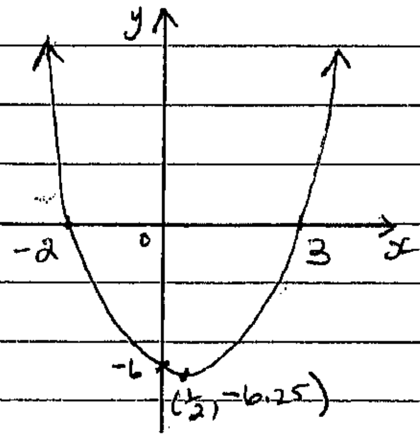


1 mark shape
1 mark all other details correct.

2marks

* Remember to add the information to the graphs. Some students worked out information near the graph but forgot to put in on the solution.

(f) $y = x^2 - x - 6$



Roots $x^2 - x - 6 = 0$
$(x-3)(x+2) = 0$ 1 mark
$\therefore x = -2, 3$

y int $= -6$ 1 mark

Vertex $= (\frac{1}{2}, -6.25)$ 1 mark

Shape of graph 1 mark

4 marks

(g) $x = \frac{-4 \pm \sqrt{4^2 - (4 \times 3 \times -1)}}{2 \times 3}$ ✓ 1mark

$= \frac{-4 \pm \sqrt{28}}{6}$

3 marks

$= \frac{-4 \pm 2\sqrt{7}}{6}$ ✓ 1 mark

$x = \frac{-2 \pm \sqrt{7}}{3}$ ✓ 1mark

Q3 – 2unit

a) i) $m = \frac{3}{4}$ $b = 3$ (1 mark)

$\therefore y = \frac{3}{4}x + 3$ (2)

ii) $\tan^{-1}\left(\frac{3}{4}\right) = 36.869\ldots$ (Calc)

$\therefore$ Acute $\angle \doteqdot 37^\circ$ (1)

iii) Sub $(16, 15)$ into $y = \frac{3}{4}x + 3$

$15 = \frac{3}{4} \times 16 + 3$

$15 = 15$ $\therefore$ Point lies on line. (1)

iv) $PN = 5$ (1)

$MN^2 = 3^2 + 4^2$

$= 25$

$MN = \sqrt{25}$

$MN = 5$ (1)

$\therefore$ Since 2 Sides =

ΔMNP is Isosceles

v) $M_{QM} = \frac{8}{4}$

$= 2$ (1)

vi) $M(-4, 0)$ $N(0, 3)$

$\frac{x - 4}{2} = 0$ $\frac{y + 0}{2} = 3$

$\therefore P = (4, 6)$ (2)

vii) $m_{PQ} = \frac{-2}{4}$ $M_{QM} = 2$ (m_2)

$m_1 = -\frac{1}{2}$

Since $m_1 \times m_2 = -1$ (1)

then $PQ \perp QM$

$\therefore \angle PQM = 90^\circ$

viii) $QM = \sqrt{80}$ $A = \frac{1}{2} \times 4 \times 8 + \frac{1}{2} \times 2 \times 4$

$PQ = \sqrt{20}$ $= 20 \text{ units}^2$

$\therefore A = \frac{1}{2} \times \sqrt{80} \times \sqrt{20}$

$= 20 \text{ units}^2$

(2)

b) $d = \frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$

$= \frac{|4 \times 5 + 5 \times -12 - 4|}{\sqrt{5^2 + (-12)^2}}$

$= \frac{44}{\sqrt{169}}$

$= \frac{44}{13}$ units (2)

24 2unit

a) $2\cos\theta = -1$

$\cos\theta = -\frac{1}{2}$

$\left(\cos 60 = \frac{1}{2}\right)$ 1

$\therefore \theta = 120^\circ, 240^\circ$ 1 for both

(2)

if $\theta = 120^\circ$ is given with no related angle 1

b) $1 - \dfrac{\sin A \cos A}{\tan A}$

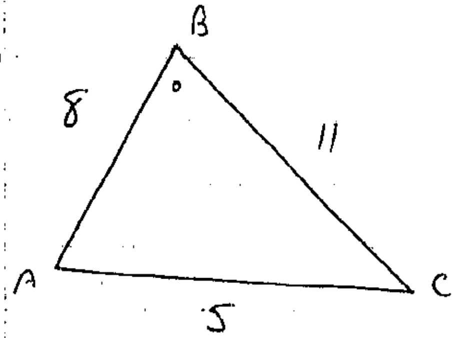
$= 1 - \sin A \cos A \div \dfrac{\sin A}{\cos A}$ 1

$= 1 - \sin A \cos A \times \dfrac{\cos A}{\sin A}$

$= 1 - \cos^2 A$ 1

$= \sin^2 A$ 1 (3)

c i)



$\cos C = \dfrac{a^2 + b^2 - c^2}{2ab}$

$= \dfrac{11^2 + 8^2 - 5^2}{2 \times 8 \times 11}$

$= 0.909\ldots$ (Calc)

$\angle ABC = 24.6\ldots$

$= 25^\circ$ (2)

ii) $A = \frac{1}{2} cb \sin C$

$= \frac{1}{2} \times 8 \times 11 \times \sin 25$

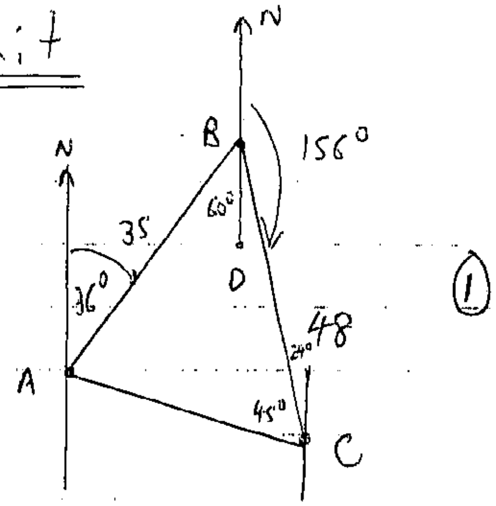
$= 18.59\ldots$ (Calc)

$= 19\ cm^2$ (2)

(Any angle) can get 2 marks

if the complete calculator answer not rounded answer was use accept 18cm²

d) i)



(1)

ii) $\angle ABD = 36$ (Alt $\angle$'s on ||)

$\angle CBD + 156 = 180$ (Straight $\angle$)

$\angle CBD = 24^\circ$

$\angle ABC = 24 + 36$

$= 60^\circ$ (1)

(Find 1 mark)

iii) $a^2 = b^2 + c^2 - 2bc \cos A$

$= 35^2 + 48^2 - 2 \times 35 \times 48 \cos 60$ 1

$a^2 = 1849$

$a = \sqrt{1849}$

$a = 43$

$\therefore AC = 43\,m$ 1

iv) $\dfrac{c}{\sin C} = \dfrac{b}{\sin B}$

$\dfrac{\sin C}{35} = \dfrac{\sin 60}{43}$ 1

$\sin C = \dfrac{35 \sin 60}{43}$

(2 marks)

$\sin C = 0.7046\ldots$

$\angle C = 44.8\ldots$

$\angle C = 45^\circ$ 1

$\therefore$ Bearing $= 291$ 1 (3)

2unit Prelim. 2010.

Question 5 3 marks

(d) In $\triangle BHE$ and $\triangle CHD$

$BH = CH$ (H is the midpoint of BC) ✓ (NOT GIVEN) *

$\angle BHE = \angle CHD$ (vertically opposite angles) ✓

$\angle EBH = \angle DCH$ (alternate angles on parallel lines)

$\therefore \triangle BHE \equiv \triangle CHD$ (A.A.S.) ✓

1 mark 1 part correct for reasons

2 marks 2 parts correct for reasons

3 marks Fully correct.

(ii) $DC = BE$ (corresponding sides in congruent triangles) ✓ (1 mark)

(iii) $DC = BE$ (from (ii))

$AB = DC$ (opposite sides in parallelogram)

$EF = DC$ (opposite sides in parallelogram)

$AB + BE + EF = 3 \times DC$

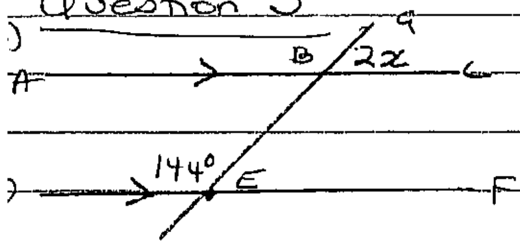
$\therefore AF = 3DC$ 1 mark

Fully Correct solution only

Preliminary Examination.

2 unit Year 11 2010

Question 5



(2 marks)

$\angle ABE = 2x°$ (vertically opposite angle)

$2x° + 144° = 180°$ (co-int. angles on parallel lines)

OR

(coint. angles, $AC \parallel DF$)

$x° = 18°$

* Poor use of reasons. Inappropriate use of symbols. $\angle$ for angle may be used.
* If reasons incomplete or non-existant 1 mark given for $18°$

(b) $\frac{6}{8} = \frac{x}{6}$ (intercepts on parallel lines) OR intercept theorem

2 marks

$8x = 36$

$x = 4.5$ cm

(c)(i) In $\triangle ABC$ and $\triangle XYC$

$\angle C$ is common

$\angle ABC = \angle XYC$ (corresponding angles, $AB \parallel XY$)

$\angle BAC = \angle YXC$ (corresponding angles, $AB \parallel XY$)

only 2 angles are necessary

$\therefore \triangle ABC \ ||| \ \triangle XYC$ (equiangular) OR (all pairs of corresponding angles are equal)

* Proofs must be finished off properly. Lazily done.

(ii) $\frac{x}{x+30} = \frac{20}{60}$ (corresponding sides in similar triangles are in proportion)

2 marks

$60x = 20(x+30)$

$60x = 20x + 600$

$40x = 600$

$x = 15$

$\therefore CY = 15$ mm

* A reason must be given.

26 - 2 unit

i) $y = 4x^3 - 6x + 7$

$y' = 12x^2 - 6$ ①

ii) $y = \dfrac{2}{x^3}$

$y = 2x^{-3}$

$y' = -6x^{-4}$ (Accept for 2 marks)

$y' = \dfrac{-6}{x^4}$ ②

iii) $y = x\sqrt{x}$

$y = x \times x^{\frac{1}{2}}$

$y = x^{\frac{3}{2}}$

$y' = \frac{3}{2}x^{\frac{1}{2}}$ (Accept) ②

$y' = \dfrac{3\sqrt{x}}{2}$

iv) $y = 5x(2x-1)^2$

$y = 5x(4x^2 - 4x + 1)$

$y = 20x^3 - 20x^2 + 5x$

② $\therefore y' = 60x^2 - 40x + 5$

$u = 5x \quad v = (2x-1)^2$

$u' = 5 \quad v' = 2(2)(2x-1)$

$= 4(2x-1)$

$y' = vu' + uv'$

$= (2x-1)^2 . 5 + 5x . 4(2x-1)$

$= (4x^2 - 4x + 1)5 + 20x(2x-1)$

$= 20x^2 - 20x + 5 + 40x^2 - 20x$

$= 60x^2 - 40x + 5$

$5(2x-1)(2x-1+4x)$

$= 5(2x-1)(6x-1)$

v) $y = (4x^3 - 7)^5$

$y' = 5 \times 12x^2(4x^3-7)^4$ ②

$y' = 60x^2(4x^3-7)^4$

vi) $u = 4x^2 - 2 \qquad u' = 8x$

$v = x + 3 \qquad v' = 1$

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

$y' = \dfrac{(x+3).8x - (4x^2-2).1}{(x+3)^2}$

$y' = \dfrac{8x^2 + 24x - 4x^2 + 2}{(x+3)^2}$ ②

$y' = \dfrac{4x^2 + 24x + 2}{(x+3)^2}$

$y' = \dfrac{2(2x^2 + 12x + 1)}{(x+3)^2}$

vii) $u = x \qquad v = (x+3)^{\frac{1}{2}}$

$u' = 1 \qquad v' = \frac{1}{2}(x+3)^{-\frac{1}{2}}$

$y' = vu' + uv'$

$y' = (x+3)^{\frac{1}{2}} + x . \frac{1}{2}(x+3)^{-\frac{1}{2}}$

$= (x+3)^{\frac{1}{2}} + \dfrac{x}{2(x+3)^{\frac{1}{2}}}$

$= \dfrac{2(x+3) + x}{2(x+3)^{\frac{1}{2}}}$

$= \dfrac{2x + 6 + x}{2\sqrt{x+3}}$ ③

$= \dfrac{3x+6}{2\sqrt{x+3}} = \dfrac{3(x+2)}{2\sqrt{x+3}}$