Name:

Teacher: _____

THE SCOTS COLLEGE

YEAR 11

MATHEMATICS ASSESSMENT

15th March, 2004

Time allowed: 50 minutes

Instructions:

- Attempt all questions
- Show all necessary working
- Approved calculators maybe used
- Start each question on a new page

PART	OUTCOME	AVAILABLE MARKS	MARKS GAINED
A	P3:performs routine arithmetic and algebraic manipulation involving surds,simple rational expressions and trigonometric identities		
B	P4:chooses and applies appropriate arithmetic,algebraic,graphical,trigonometric and geometric techniques		
C	P5:understands the concept of a function and the relationship between and a graph		
D	P2:provides reasoning to support conclusions which are appropriate to the context		

PART A (START A NEW PAGE) 19 marks

1) Write the number 0.075827 in scientific notation correct to

   a) 2 significant figures

   b) 3 decimal places

/2

2) If $P = \sqrt{\frac{2R-V}{5}}$ Find V when P = 0.2 and R = 20

/2

3) Simplify $2x(4x^2+3x-1) - x(2x^2+7x-3)$

/2

4) Solve $|5x - 3| < 2$

   Graph the solution on a number line

/3

5) Express $2.1\dot{3}\dot{6}$ as a common fraction /2

6) Express as a single fraction with a rational denominator

$$\frac{1}{2\sqrt{3}-1} + \frac{3}{\sqrt{3}+1}$$

/3

7) Solve

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

/3

8) Given $x = \sqrt{2a}$ and $y = 3a^2$ express $2x^2y^3$ in terms of *a*.
   Simplify your answer as far as possible. /2

PART B (START A NEW PAGE) **16 marks**

1) Factorise

a) $a^2 - a - 42$ /1

b) $15a^2 - 60$ /2

c) $\frac{a^3}{8} - 64$ /1

d) $m^2 - mn + 6m - 6n$ /2

2) Simplify $\frac{4x^3y - 16xy}{4x^2 - 8x}$ /2

3) Solve the simultaneous equations

$$\frac{x}{5} - \frac{y}{4} = -1$$

$$x - \frac{y}{3} = 6$$ /3

4) Simplify $\frac{2a^2 - 3ab}{ab - b^2} \div \frac{4a - 6b}{2a^2 - 2ab}$ /3

5) Solve $2x^2 + 5x = 6$ /2

PART C (START A NEW PAGE) **16 marks**

1) State the largest possible domain for these functions

a) $f(x) = \dfrac{1}{\sqrt{2x-7}}$ /1

b) $f(x) = \dfrac{x}{x^2-4} + \dfrac{3}{x-5}$ /2

2) Make sketches of the following. State the domain and range in each case.

a) $y = 4^{-x}$ /3

b) $y = \dfrac{3}{x+2}$ /3

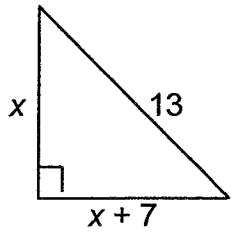
3) Sketch the graph of $f(x) = |2x-5|$ and indicate on it the values of x for which $f(x) = 3$ /4

4) Indicate on a number plane the region in which

$9 \leq x^2 + y^2 < 25$ /3

Part D (START A NEW PAGE) **15 marks**

1) Use Pythagoras Theorem to find the value of x /3



2) Each interior angle of a regular polygon is 8 times the exterior angle. How many sides has the polygon?

/2

3) A point P is inside a square ABCD such that triangle DPC is equilateral. Prove that:

i. Δ APD $\equiv$ Δ BPC

/3

ii. ΔAPB is isosceles

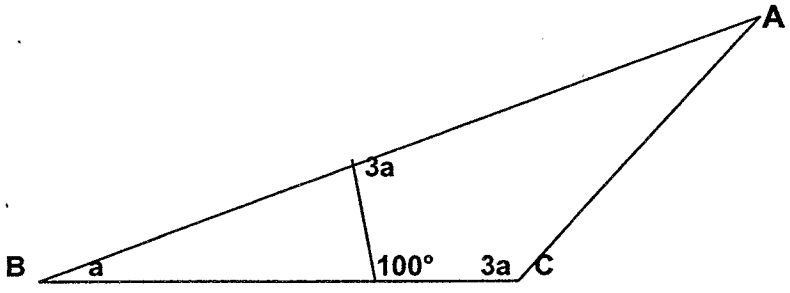
/1

4) A man, 1.6 metres tall, standing 3 metres from a street light casts a shadow 2 metres long. How high is the light above the ground?

/3

5) Find the value of 'a' and hence the size of $\angle$BAC

/3



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PART D

Siarduro

$13^2 = x^2 + (x+7)^2$ ✓1

$169 = x^2 + x^2 + 14x + 49$

$2x^2 + 14x - 120 = 0$

$x^2 + 7x - 60 = 0$

$(x+12)(x-5) = 0$

$x = -12 \quad x = 5$ ✓1

$x = -12$ Not a Solution ½

$\therefore x = 5$ ✓1 ½

) Let exterior Angle $= x$

$\therefore 8x + x = 180$

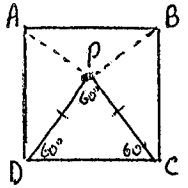
$9x = 180$

$x = 20$ ✓1

$360 \div 20 = 18$

The Polygon has 18 sides ✓1

3)



i) Prove $\Delta APD \equiv \Delta BPC$

$AD = BC$ (Sides of Square =)

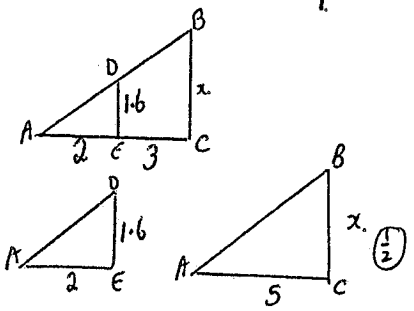
$\angle ADP = \angle PCB = 30°$ (Angles of Square $= 90°$) ✓2

$DP = PC$ (Sides of Equilateral Δ)

$\therefore \Delta APD \equiv \Delta BPC$ through SAS test ✓1

ii) From Part i) AP = PB are corresponding sides of Congruent Triangles. Therefore Δ APB is isosceles ✓1

4)



½

$\angle AED = \angle ACB$ (Corresponding $\angle$s =)

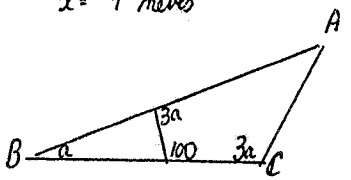
$\angle A$ is common Angle

$\therefore \Delta AED \,|||\, \Delta ACD$ ✓2 (1½)

$\frac{x}{1.6} = \frac{5}{2}$

$x = 4$ metres ✓1

5)



$\angle BAC = 180 - 4a$

$\therefore 3a + 100 + 3a + (180 - 4a) = 360°$

(Angle Sum of Quad)

$2a + 280 = 360°$

$2a = 80$

$a = 40$ ✓2

$\therefore \angle BAC = 180 - 4a$

$= 180 - 4(40)$

$= 20°$ ✓1

PART C

O'Connell

1a) $2x - 7 > 0$

$2x > 7$

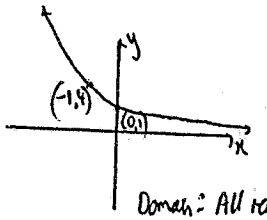
$x > 7/2$. ✓1

b) All real x except

$x = \pm 2$ or 5

✓1 ✓1

2 a)

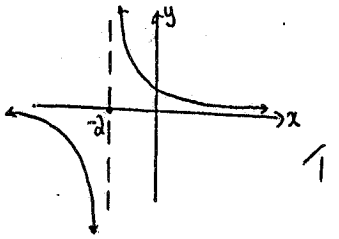


✓1

Domain: All real x ✓1

Range: $y > 0$ ✓1

b)

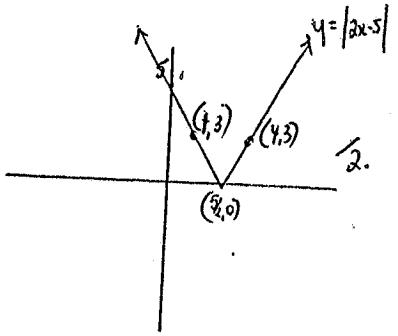


✓1

Domain: All real x except $x = 2$ ✓1

Range: All real y except $y = 0$ ✓1

3)



✓2.

If $f(x) = 3$

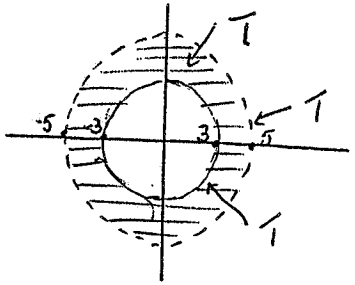
$\therefore |2x - 5| = 3$

$2x - 5 = 3$ or $2x - 5 = -3$

$2x = 8$ $\quad 2x = 2$

$x = 4$ $\quad x = 1$ ✓2

4)



✓1 ✓1 ✓1

PART B — Young

a) $(a-7)(a+6)$ ✓1

b) $15a^2-60$

$=15(a^2-4)$ ✓1

$=15(a+2)(a-2)$ ✓1

c) $\frac{a^3}{8}-64$

$=\left(\frac{a}{2}-4\right)\left(\frac{a^2}{4}+2a+16\right)$ ✓1

d) $m(m-n)+6(m-n)$ ✓1

$=(m-n)(6+m)$ ✓1

) $\frac{4x^3y-16xy}{4x^2-8x}$

$=\frac{4xy(x^2-4)}{4x(x-2)}$ ½

$=\frac{4xy(x+2)(x-2)}{4x(x-2)}$ ½

$=4(x+2)$ ✓1

) $\frac{x}{5}-\frac{y}{4}=-1$ ...①

$x-\frac{y}{3}=6$ ...②

① ×20 $4x-5y=-20$ ...③

② ×3 $3x-y=18$ ...④ ✓1

③ ×3 $12x-15y=-60$ ...⑤

④ ×4 $12x-4y=72$ ...⑥ ✓1

⑤−⑥

$-11y=-132$

$y=12$

... ✓1

4) $\frac{2a^2-3ab}{ab-b^2} \times \frac{2a^2-2ab}{4a-6B}$

$=\frac{a(2a-3B)}{B(a-B)} \times \frac{2a(a-B)}{2(2a-3B)}$ ✓2

$=\frac{2a^2}{2B}$

$=a^2/B$ ✓1

5) $2x^2+5x-6=0$

$a=2 \quad B=5 \quad c=-6$

$x=\frac{-B\pm\sqrt{B^2-4ac}}{2a}$

$x=\frac{-5\pm\sqrt{25-4(2)(-6)}}{2(2)}$ ✓1

$x=\frac{-5\pm\sqrt{25+48}}{4}$

$x=\frac{-5\pm\sqrt{73}}{4}$ ✓1

PART A — Andrews

1) 0.075827

$=7.5827\times10^{-2}$

a) 7.6×10^{-2} ✓1

b) 7.583×10^{-2} ✓1

2) $P=\sqrt{\frac{2(20)-V}{5}}$

$0.2=\sqrt{\frac{40-V}{5}}$

$0.04=\frac{40-V}{5}$

$0.2=40-V$

$V=39.8$ ✓2

3) $2x(4x^2+3x-1)-x(2x^2+7x-3)$

$=8x^3+6x^2-2x-2x^3-7x^2+3x$ ✓1

$=6x^3-x^2+x$ ✓1

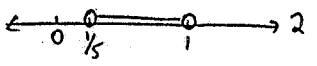
4) $|5x-3|<2$

$5x-3<2$ or $-(5x-3)<2$

$5x<5$ $\quad -5x+3<2$

$x<1$ ✓1 $\quad -5x<-1$

$x>\frac{1}{5}$ ✓1



✓1

5) Let $x=2.13636\ldots$ ①

$100x=213.636\ldots$ ② ✓1

②−①

$99x=211.5$

$x=\frac{211.5}{99}$

... ✓1

6) $\frac{1}{2\sqrt{3}-1}\times\frac{(\sqrt{3}+1)}{(2\sqrt{3}+1)}$ — Kowtard-Jones

$=\frac{2\sqrt{3}+1}{12-1}$

$=\frac{2\sqrt{3}+1}{11}$ ✓1

$\frac{3}{(\sqrt{3}+1)}\times\frac{(\sqrt{3}-1)}{(\sqrt{3}-1)}$

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

$=\frac{3\sqrt{3}-3}{2}$ ✓1

$\therefore \frac{2\sqrt{3}+1}{11}+\frac{3\sqrt{3}-3}{2}$

$=\frac{4\sqrt{3}+2}{22}+\frac{33\sqrt{3}-33}{22}$

$=\frac{37\sqrt{3}-31}{22}$ ✓1

7) $\frac{3(x-2)}{5}=\frac{2(x-1)}{3}-\frac{2}{5}$

$\frac{9(x-2)}{15}=\frac{10(x-1)}{15}-\frac{6}{15}$ ✓1

$9x-18=10x-10-6$ ✓1

$-18=x-16$

$-2=x$

$x=-2$ ✓1

8) $2x\left(\sqrt{2a}\right)^2\times\left(3a^2\right)^3$

$=2\times2a\times27a^6$ ✓1

$=108a^7$ ✓1