MARCELLIN COLLEGE RANDWICK

YEAR 11
ACCELERATED MATHEMATICS

PRELIMINARY ASSESSMENT TASK 2
2016

STUDENT NAME: ______________________ MARK ____ /34

TEACHER: ______________________

TIME ALLOWED: 45 minutes
WEIGHTING: 70 %

Directions:

- Answer multiple choice questions on the page provided.
- Use a new sheet for additional questions.
- Show all necessary working. Where more than one mark is allocated to a question, full marks may not be awarded for answers only.
- Marks may not be awarded for careless or badly arranged work.
- Calculators may be used

Section 1 (31 marks)

Allow about 40 minutes for this section
Show all working

Marks

1. Find the exact value of

   i) $\sin 330°$ — 1

   ii) $\tan(-225°)$ — 1

2. Solve for θ in the following:

   i) $2\cos\theta + 1 = 0$ for $-180° \leq \theta \leq 180°$ — 2

   ii) $\tan 2\theta = 1$ for $0 \leq \theta \leq 360°$ — 2

3. Prove that — 2

$$\frac{\cos\theta}{1-\sin\theta} - \tan\theta = \sec\theta$$

4. Find the equation of the straight line that contains the intersection point of the lines $3x + 2y - 12 = 0$ and $5x - y - 7 = 0$ which is parallel to the line $2x - y + 4 = 0$ — 3

5. Find the quadratic equation that has roots $3+\sqrt{2}$ and $3-\sqrt{2}$ — 2

6. Sketch and find the equation of the locus of a point $P(x, y)$ that moves so that:

a) its distance from $(2, 1)$ is always 4 — 3

b) it is equidistant from the points $A(3, 2)$ and $B(9,5)$ — 3

7. Solve for x in the following equation — 2

$$(x-2)^2 - 2(x-2) - 15 = 0$$

8. Calculate the perpendicular distance from the point $(1, 4)$ and the line $3x - 4y + 12 = 0$, leaving your answer in exact form — 3

9. Prove that the line $x - y + 1 = 0$ is a tangent to the parabola $y = x^2 - 3x + 5$ — 2

10. Find — 2

$$\lim_{x \to -2} \frac{x-2}{x^2-4}$$

11. Two people set out from point P at the same time. One travels at 20 km h^{-1} along a straight road in the direction 032°. The other travels at 25 km h^{-1} along a straight road in the direction 132°. Find their distance apart after 3 hours (to the nearest km). — 3

Section II – Multiple Choice (4 marks)

Use the multiple choice answer sheet for Questions 12 – 15
Allow about 5 minutes for this section

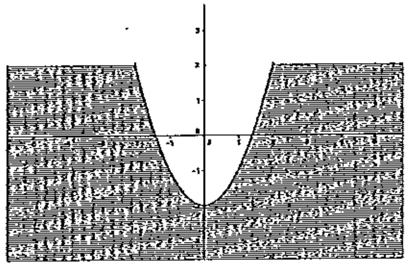
12. The line $6x - ky = 2$ passes through the point $(3, 2)$. What is the value of k?

(A) $-\frac{10}{3}$ (B) 8 (C) -8 (D) $\frac{10}{3}$

13. What is the value of k if the sum of the roots of $x^2 - (k-1)x + 2k = 0$ is equal to the product of the roots?

(A) -3 (B) -2 (C) -1 (D) 1

14. Which of the following inequalities satisfy the region sketched below



(A) $y \leq 2$ and $y \geq x^2 - 2$ (B) $y \leq 2$ and $y \leq x^2 - 2$

(C) $y \geq 2$ and $y \geq x^2 - 2$ (D) $y \geq 2$ and $y \leq x^2 - 2$

15. Select the equation for which $\Delta > 0$

(A) $x^2 + 2x + 3 = 0$ (B) $x^2 + 6x + 9 = 0$

(C) $2x^2 - 4x + 5 = 0$ (D) $x^2 - 4x - 5 = 0$

MARCELLIN

YR 11 ADVANCED MATHS

PRELIM ASSESSMENT 2. 2016.

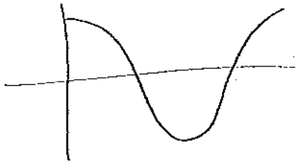
1\. i) $\sin 330° = -0.5$

ii) $\tan(-225°) = -1$.

2\. i) $2\cos\theta + 1 = 0$

$\cos\theta = -\frac{1}{2} = -0.5$

S	A
T	C.



$\theta = 120°, -120°$

ii) $\tan 2\theta = 1. \quad 0 \le \theta \le 360°$

ie $2\theta = \tan^{-1}(1)$

$\theta = 22.5°, 112.5°$

3\. RTP $\frac{\cos\theta}{1-\sin\theta} - \tan\theta = \sec\theta$

Multiply both sides by $1-\sin\theta$

$\cos\theta - \tan\theta + \tan\theta\sin\theta = \sec\theta - \sec\theta\sin\theta$

but $-\sec\theta\sin\theta = -\tan\theta$

ie $\cos\theta + \tan\theta\sin\theta = \sec\theta$

Multiply by $\cos\theta$ both sides.

$\cos^2\theta + \sin^2\theta = 1 \Rightarrow$ Basic Identity.

$\therefore$ Proven.

4\. Intersection points

\- use simultaneous equs..

① $y = \frac{12-3x}{2}$

② $y = 5x - 7$

$\frac{12-3x}{2} = 5x - 7$

$12 - 3x = 10x - 14$

$13x = 26$

$x = 2$.

when $x = 2$.

$10 - y - 7 = 0, \; y = 3$.

parallel to line.

$2x - y + 4 = 0$.

in standard form

$y = 2x + 4$

$m = 2$.

use point gradient Formula

$(y-3) = 2(x-2)$

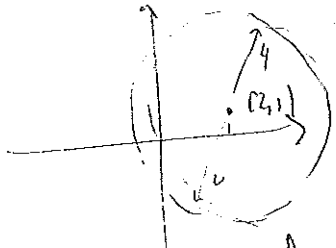
$y - 3 = 2x - 4$.

$y = 2x - 1$ #

5\. $(x-(3+\sqrt{2}))(x-(3-\sqrt{2})) = y$.

$= y = x^2 - 6x + 7$

6\. a)

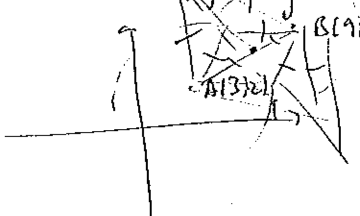


ie the set of all points that $P(x,y)$ can lie on within the set of the circle centre $(2,1)$ Radius 4.

ie. $(x-2)^2 + (y-1)^2 = 16$

$x^2 - 4x + y^2 - 2y - 11 = 0$

b)



Locus is a line with point half way through AB and Perpendicular to AB

$m_{AB} = \frac{5-2}{9-3} = \frac{3}{6} = \frac{1}{2}$

$m_{Locus} = -2$.

mid point $= \frac{9+3}{2}, \frac{5+2}{2}$

$= 6, \frac{7}{2}$.

$\left(y - \frac{7}{2}\right) = -2(x-6)$

$2y - 7 = -4x + 24$.

$4x + 2y - 31 = 0$

7\. $(x-2)^2 - 2(x-2) - 15 = 0$

Let $u = x - 2$

$u^2 - 2u - 15 = 0$

$(u+3)(u-5) = 0$

$u = -3$ OR $u = 5$

ie $x - 2 = -3, \; x = -1$

OR

$x - 2 = 5, \; x = 7$

8\. $\frac{|3(1) - 4(4) + 12|}{\sqrt{25}}$

$= \frac{1}{5}$

9. Tangent only touches parabola at one point, so there exists only one real solution to the simultaneous eqn.

$x - y + 1 = 0$

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

$x^2 - 3x + 5 = x + 1$

$x^2 - 4x + 4$

$= (x-2)^2 \Rightarrow$ so only one solution for x.

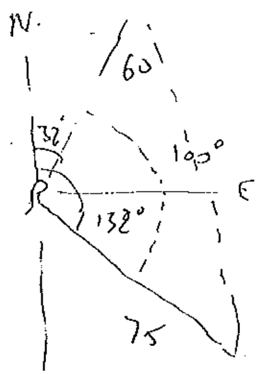
i.e. the line is a tangent to the parabola as it only cuts it at one point.

10. $\lim_{x \to -2} \frac{(x-2)}{(x+2)(x-2)}$

$= \lim_{x \to -2} \frac{1}{(x+2)}$

$= \infty$

11.



Using the cosine rule.
Let d be distance apart after 3 hours

$d^2 = 60^2 + 75^2 - 2(60)(75)\cos 100°$

$d \simeq 104$ km (nearest km.

12. B

13. C

14. B

15. D