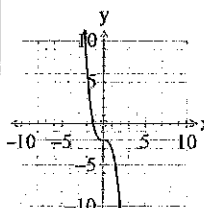
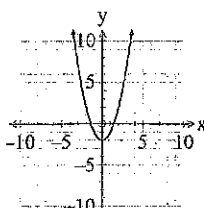
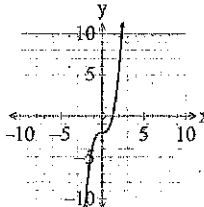
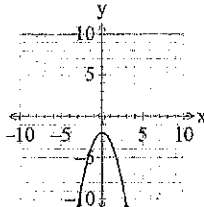
 KINCOPPAL – ROSE BAY SCHOOL OF THE SACRED HEART			
Mathematics Department Year 10 5.3 Assessment Task 3 2017			
Name:		Date:	Friday 18 th August 2017
Weighting:	20%	Time Allowed:	50 minutes
Topics:	<ul style="list-style-type: none"> • Non-Linear Relationships • Probability 		
Outcomes Assessed:			
MA5.3-7NA	Solves complex linear, quadratic, simple cubic and simultaneous equations, and rearranges literal equations.		
MA5.3-9NA	Sketches and interprets a variety of non-linear relationships		
MA5.1-13SP	Calculates relative frequencies to estimate probabilities of simple and compound events.		
MA5.2-17SP	Describes and calculates probabilities in multi-step chance experiments		
Instructions:			
<ul style="list-style-type: none"> • Use blue or black pen to complete the test and pencil for graphing. • Show all necessary working out. • Calculators may be used. 			
Results:			
Multiple Choice			[8]
Non-Linear Relationships			[16]
Probability			[26]
Total			[50]

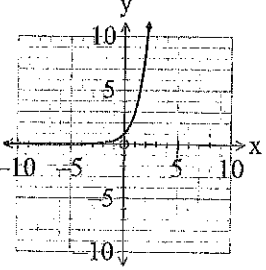
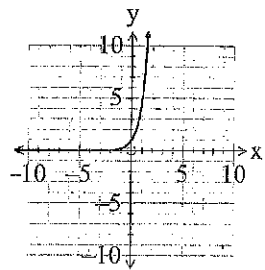
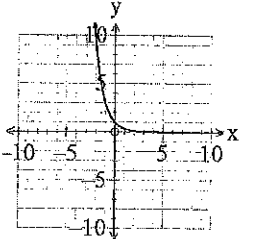
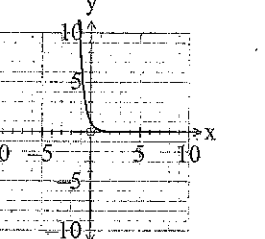
Section I: Multiple Choice (8 marks)

Circle the letter of the correct answer.

Marks

1. Find the length of the radius of the circle $x^2 + y^2 - 9 = 0$	1
A. -9 B. 9 C. -3 D. 3	
2. Which of the following graphs best represents the equation $y = -2 - x^3$?	1
A. 	B. 
C. 	D. 
3. A parabola passes through (1, 2) and has an axis of symmetry of $x = 3$. What could be the equation of the parabola?	1
A. $y = x^2 - 3x + 4$ B. $y = x^2 - 6x + 7$ C. $y = x^2 - 6x$ D. $y = x^2 - 6x + 8$	

<p>4. A mother has two children. What is the probability of a mother having two baby girls?</p> <p>A. $\frac{1}{2}$ B. 2 C. 1 D. $\frac{1}{4}$</p>	1
<p>5. What are the asymptotes for the equation $y = \frac{2}{x} + 2$?</p> <p>A. $x = 0$, $y = 2$ B. $x = 0$, $y = 0$ C. $x = 2$, $y = 0$ D. No asymptotes</p>	1
<p>6. What is the total number of outcomes of tossing a coin 5 times?</p> <p>A. 5 B. 10 C. 16 D. 32</p>	1
<p>7. $y = x^2 + 2$ and $y = 2x^2$ are graphs on the same number plane. Which one of the following statements is true?</p> <p>A. Both parabolas pass through the origin. B. Both parabolas are concave up. C. Both parabolas have a y-intercept of 2. D. Both parabolas have the same minimum value.</p>	1

<p>8. Which graph represents the curve $y = 3^x$. Assume the x-axis has an asymptote of zero.</p>	1
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>A.</p>  </div> <div style="text-align: center;"> <p>B.</p>  </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;"> <p>C.</p>  </div> <div style="text-align: center;"> <p>D.</p>  </div> </div>	
<p>End of Section 1</p>	

Section II: Extended response section

Show all working using clear and logical setting out

Part A: Non-linear relationships		Marks
1.	What is the maximum value of y if $y = 4 - x - x^2$?	1
2.	Sketch the graph $(x-1)^2 + (y+3)^2 = 16$	3
3.	For the parabola $y = x^2 - 6x + 8$ find: i) State the y -intercept. ii) Find the axis of symmetry.	1 1

iii)	Find the vertex.	1
iv)	Find the x -intercepts.	1
v)	Hence, sketch the curve and label all features found above.	2

4.	The parabola $y = x^2$ is shifted vertically upward 3 units and horizontally to the right 2 units. State the new equation of the parabola.	2
5.	Complete the square to find the centre and radius of $x^2 - 4x + y^2 + 5y = 2$.	2

6.	Sketch the graph $y = \frac{1}{x-3} - 2$, labelling any intercepts and asymptotes.	2
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Part B: Probability		Marks
1.	A coin is tossed three times.	
	i) List all possible outcomes.	1
	ii) What is the probability of tossing three heads or three tails?	1
	iii) What is the probability of tossing a head and two tails in any order?	2
2.	Cards with the numbers from 1 to 15 are placed in a bag. A card is chosen at random from the bag.	
	i) Find the probability that the number is less than 10.	1
	ii) If the number is greater than 5, what is the probability it is even?	1
	iii) If the number is a factor of 15, what is the probability that it is a prime number?	2

3.	A jar contains 20 lollies of which 10 are red, 6 are green and 4 are yellow. Two lollies are chosen at random. The first is eaten before the second is selected.	
	i) Complete the tree diagram by writing in the correct probabilities on the branches.	2
	ii) Find the probability that both lollies are red	1
	iii) Find the probability of choosing the same colour.	1
	iv) Find the probability of choosing at least one green lolly.	2

4.	There are eight runners in a race. Assuming there are no dead-heats ties, in how many ways can first and second place be filled?	1															
5.	A six-digit number is to be formed from the digits 4, 4, 5, 6, 6 and 6 that are written on cards. How many different ways would the cards start with the number 4 and end in the number 6?	2															
6.	When children started school they were tested to see if they could swim. The results appear in the two-way table below.	3															
	<table border="1"> <thead> <tr> <th></th> <th>Swim</th> <th>Cannot Swim</th> <th>Totals</th> </tr> </thead> <tbody> <tr> <td>Boys</td> <td>95</td> <td>14</td> <td>109</td> </tr> <tr> <td>Girls</td> <td>106</td> <td>B</td> <td>124</td> </tr> <tr> <td>Totals</td> <td>A</td> <td>32</td> <td>C</td> </tr> </tbody> </table> <p>i) State the missing value from the table above.</p> <p>A:</p> <p>B:</p> <p>C:</p>			Swim	Cannot Swim	Totals	Boys	95	14	109	Girls	106	B	124	Totals	A	32
	Swim	Cannot Swim	Totals														
Boys	95	14	109														
Girls	106	B	124														
Totals	A	32	C														

ii)	What is the probability that a boy chosen at random cannot swim?	1
iii)	What is the probability that a child, who cannot swim, is a girl?	1
7.	On a particular day, the training patterns of 40 female triathletes were recorded on the Venn diagram.	1
	<p> $C = \text{Cycling}$ $R = \text{Running}$ $S = \text{Swimming}$ </p>	
	If a triathlete was chosen at random, what is the probability that she:	1
i)	Swam and cycled	
ii)	Ran, cycled and swam	1

8. Graph must have
the shape of
A, B, C

3^x tends to
infinity for $x \rightarrow \infty$

test values next. ex. at
 $10 = 3^x$ $y = 10$

$$\ln 10 = x \ln 3$$

$$x = \frac{\ln 10}{\ln 3} \approx 2$$

$\therefore A$

PART A - NONLINEAR

1. $y = 4 - x - x^2$

maximum at point of
symmetry = $-\frac{b}{2a}$

\Rightarrow Rearranging

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

$$-\frac{b}{2a} = \frac{1}{-2}$$

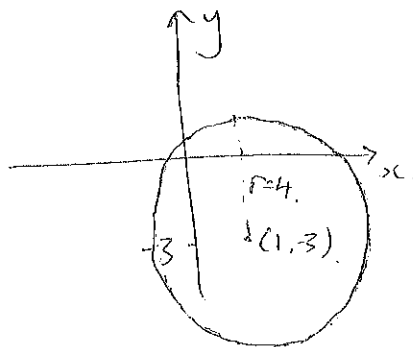
Substitute for 'x'

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

$$= \frac{17}{4}$$

\therefore maximum value
 $= \left(-\frac{1}{2}, \frac{17}{4}\right)$

2. $(x-1)^2 + (y+3)^2 = 16$
centre at $1, -3$.
radius of $\sqrt{16} = 4$.



3. $y = x^2 - 6x + 8$
i) y intercept = 8
ii) axis of symmetry = $\frac{b}{2a} = \frac{6}{2}$
 $= 3 \rightarrow x = 3$

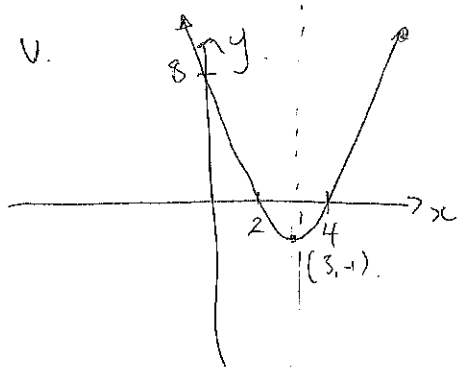
iii) vertex \Rightarrow sub in $x = 3$.
 $y = 9 - 18 + 8 = -1$
vertex = $(3, -1)$.

iv) - x intercepts.

$$0 = (x-2)(x+4)$$

x intercepts at

$$(2, 0), (4, 0)$$



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

5. $x^2 - 4x + y^2 + 5y = 2$

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

$$(x-2)^2 + \left(y + \frac{5}{2}\right)^2 = 12.25$$

centre $(2, -\frac{5}{2})$, radius 3.5 units.

6. $y = \frac{1}{x-3} - 2$.

asymptotes.

$x = 3$.

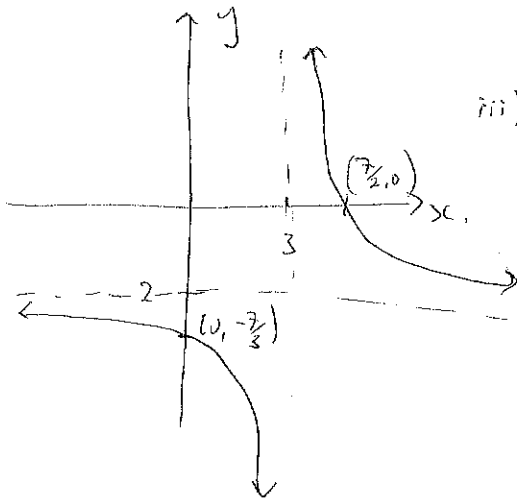
$y = -2$.

Intercepts.

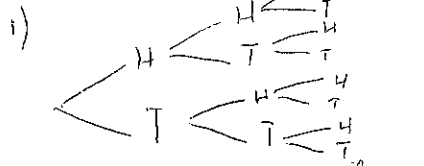
$y = \frac{1}{x-3} - 2 = -\frac{7}{3}$.

$x-3 = \frac{1}{2}$

$x = \frac{1}{2} + 3 = \frac{7}{2}$.



Part B - Probability.



HHH $\frac{1}{8}$ equal chance of happening for all outcomes.

- HHH
- HHT
- HTH
- HTT
- TTH
- THT
- TTH
- TTT

ii) $P(TTT \text{ OR } HHH) = \frac{1}{8} + \frac{1}{8} = \frac{1}{4}$.

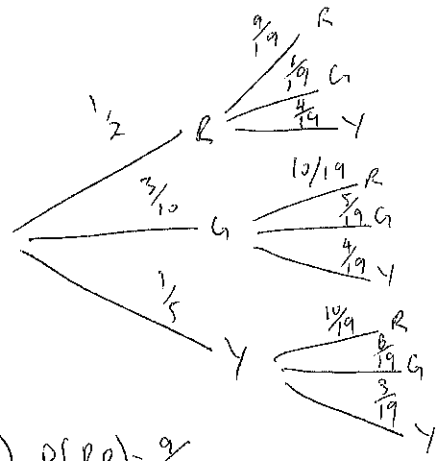
iii) $P(HTT) + P(THT) + P(TTH) = \frac{3}{8}$.

2. i) $\frac{9}{15} = \frac{3}{5}$.

ii) $\frac{5}{10} = \frac{1}{2}$.

iii) 1, 5, 3, 15.
5, 3 are prime.
 $= \frac{2}{4} = \frac{1}{2}$.

3. i)



20 lollies.
6 green -
10 red -
4 yellow.

- RR = $\frac{9}{58}$
- RG = $\frac{3}{19}$
- RY = $\frac{2}{19}$
- GR = $\frac{3}{19}$
- GG = $\frac{3}{38}$
- GY = $\frac{6}{95}$
- YR = $\frac{2}{95}$
- YG = $\frac{6}{95}$
- YY = $\frac{3}{95}$

ii) $P(RR) = \frac{9}{38}$

iii) $P(RR) + P(GG) + P(YY) = \frac{33}{95}$

iv) $P(RG) + P(GR) + P(GG) + P(GY) + P(YG) = \frac{99}{190}$.

4. $\{A, B, C, D, E, F, G, H\}$
 $\Rightarrow 8 \times 7 = 56$

5. 4, 4, 5, 6, 6, 6.
if we set 4 as front and 6 at back, we can arrange the rest of the cards.
4, 5, 6, 6 however we like

- 4566
- 4656
- 4665
- 5466
- 5646
- 5664
- 6456
- 6546
- 6465
- 6564
- 6645
- 6654

12 possibilities.

6.

	Swim	Can't swim	TOTAL
BOYS	95	14	109
GIRLS	126	18	144
TOTAL	201	32	233

i) $A = 201$

$B = 18$

$C = 233$

ii) $P(\text{Boy and cannot swim}) = \frac{14}{109}$

iii) $P(\text{child who cannot swim is a girl}) = \frac{9}{16}$

7. i) $P(\text{Swam and cycled}) = \frac{1}{40}$

ii) $P(\text{Ran, cycled and swam}) = \frac{1}{40} = \frac{1}{40}$

i) $P(\text{cycled who also ran}) = \frac{6}{18}$

ii) $P(\text{cycled who didn't swim}) = \frac{7}{18}$