Barker College

Student Name: _____

Teacher Initials: _____

AYG	BHC
ARP	RAS*
PDJ	JWH
DXC	VAB
WMD (KJL)	WMD
	JZT

Thursday, 15th August 2019
Period 3 or 5
50 minutes
240 copies

Year 10
5.3 MATHEMATICS
Assessment Task #3

General Instructions

- Write your name in the spaces provided
- Write using blue or black pen
- Answer in the spaces provided
- NESA approved calculators may be used
- Show ALL necessary working
- Diagrams are NOT to scale
- Marks may not be awarded for careless or poorly arranged working
- A reference sheet is attached to the end of this paper, which may be detached.

Section	Marks
1. Trigonometry	/ 20
2. Geometry	/ 17
3. Graphs	/ 23
Total Marks:	**/ 60**

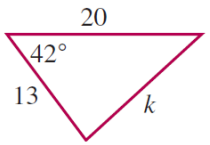
Part 1: Trigonometry (20 marks)

1. Theon was standing on the edge of a vertical cliff and spotted a boat out to sea. The angle of depression from Theon to the boat was 40°. The boat was 100m from the base of the cliff.

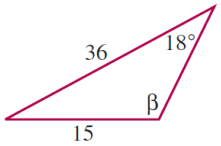
(i) Draw a diagram of this scenario, showing all given information. **1**

(ii) How high was the cliff, above sea level, to the nearest metre? **2**

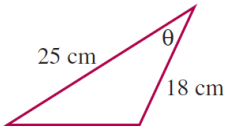
2. Find the value of k, rounding your answer to 1 decimal place. **3**



3. If β is *obtuse*, find the size of angle β, rounded to the nearest minute. **3**



4. The area of the following triangle is 90 cm^2. Find the value of θ, rounded to the nearest minute. **2**



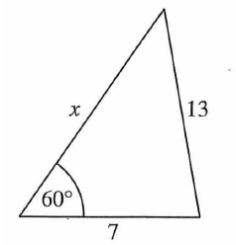
5. Shayna flew her light plane 28 km from A to B on a bearing of 138°, then turned and flew 25 km to C, which is due east of A.

(i) Draw a diagram of this scenario, showing all necessary information. **2**

(ii) Find the size of $\angle ACB$, correct to the nearest degree. **2**

(iii) Hence find the bearing of B from C. **1**

6. The diagram below shows a triangle with sides 7 cm, 13 cm and x cm, with an angle of 60° as marked.



(i) Use the cosine rule to show that $x^2 - 7x = 120$ **2**

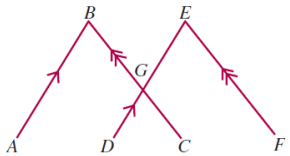
(ii) Hence find the exact value of x. **2**

Part 2: Geometry (17 marks)

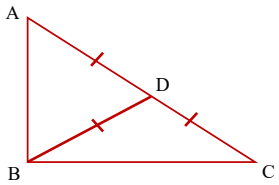
1. What is the interior angle sum of a 7-sided figure? **2**

2. A regular polygon has an exterior angle of 18°. How many sides does this shape have? **1**

3. In the diagram below, $AB \parallel DE$ and $BC \parallel EF$. Prove that $\angle ABC = \angle DEF$, giving full reasons. **3**

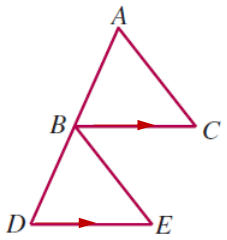


4. In the diagram below, $DA = DB = DC$. Prove that $\angle ABC = 90^\circ$, giving full reasons. **3**



5. In the diagram below, BC bisects AD, $BC \parallel DE$ and $BC = DE$.

(i) Prove that $\Delta ABC \equiv \Delta BDE$ by completing the following, giving full reasons. **3**



In ΔABC and ΔBDE,

1. _____

_____

_____

2. _____

_____

_____

3. _____

_____

_____

$\therefore \Delta ABC \equiv \Delta BDE$ (_____)

(ii) Hence prove $AC \parallel BE$. **2**

_____

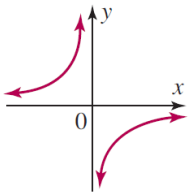
_____

6. Pierre sculpted a miniature horse with height 20 cm to serve as a model for a larger artwork of height 1.5 m. If 10 cm^3 of clay is needed for the miniature horse, how much would be needed for the larger artwork? **3**

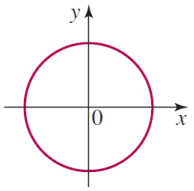
Part 3: Graphs (23 marks)

1. Using the options below, write down the equations of the following graphs. One should be left over. **3**

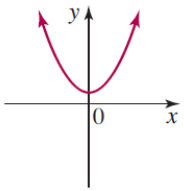
A. $y = 3^x$ **B.** $y = x^2 + 1$ **C.** $x^2 + y^2 = 16$ **D.** $y = -\frac{1}{x}$ **E.** $y = 3^{-x}$



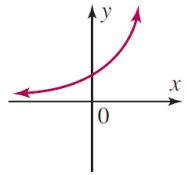
Equation:



Equation:



Equation:



Equation:

2. Given the original equation $y = x^3$, write down a new equation that will:

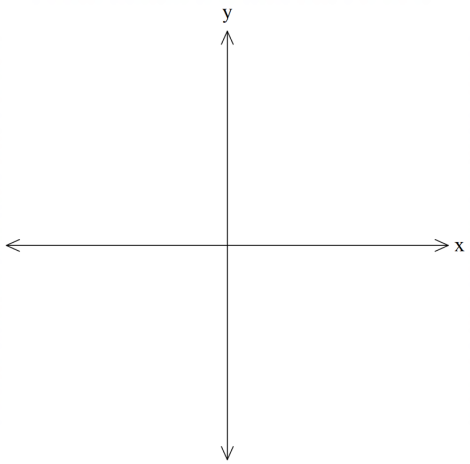
a. Move it down 3 units **1**

b. Reflect it across the x-axis **1**

c. Move it left 4 units. **1**

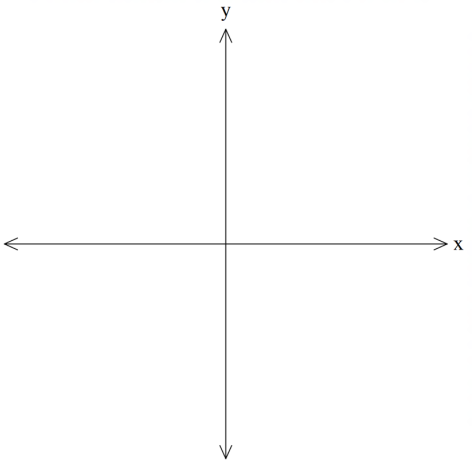
3. By completing the square, find the centre and radius of the circle defined by $x^2 + y^2 - 4y = 8$ **3**

4. Sketch $y = -2(x-1)^4$ on the axes below, showing any x or y-intercepts. **3**

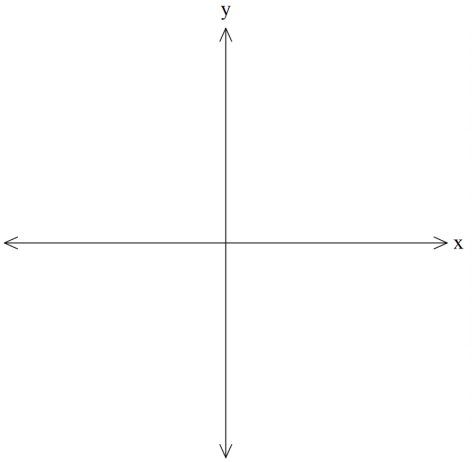


5. Sketch the following graphs on the axes below, showing any intercepts and/or asymptotes.

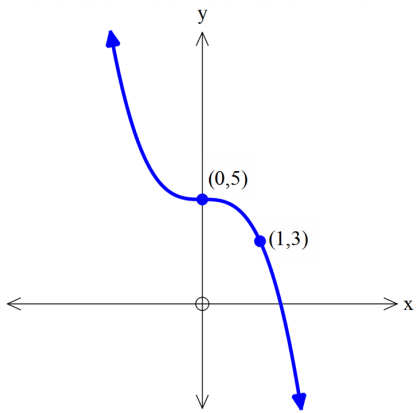
a. $y = 2^x + 1$ **3**



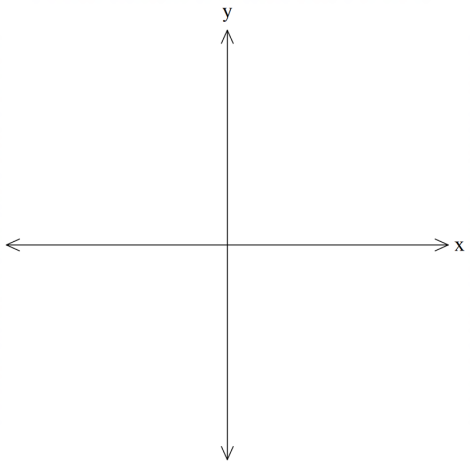
b. $y = \dfrac{1}{x+3}$ **2**



6. Determine the equation of the following graph. **3**



7. Sketch $y = 4 - 2^{3-x}$ on the axes below, showing any intercepts and/or asymptotes. **3**



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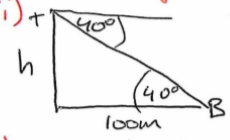
Year 10 S Ass #3

Student Solutions

Part 1: Trigonometry

1. (i)



(ii) $\tan 40 = \frac{h}{100}$

$h = 100 \times \tan 40$

$h = 84m$

2. $k^2 = 13^2 + 20^2 - 2(13)(20)\cos 40°$

$k^2 = 569 - 386.435\ldots$

$k^2 = 182.56\ldots$

$k = 13.5$

3. $\frac{\sin\beta}{36} = \frac{\sin 18}{15}$

$\sin\beta = \frac{36 \times \sin 18}{15}$

$\beta = 47°52'$

$180 - 47°52'$

$\beta = 132°8'$

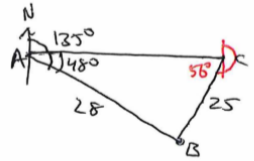
4. $\frac{1}{2}(25 \times 18)\sin\theta = 90$

$225\sin\theta = 90$

$\sin\theta = \frac{2}{5}$

$\theta = 23°35'$

5 (i)



(ii) $\frac{\sin C}{28} = \frac{\sin 48}{25}$

$\sin C = \frac{28 \times \sin 48}{25}$

$C = 56°$

(iii) $270 - 56 = 214°$

6 (i) $\cos 60 = \frac{x^2 + 7^2 - 15^2}{2(x)(7)}$

$\frac{1}{2} = \frac{x^2 - 120}{14x}$

$7x = x^2 - 120$

$x^2 - 7x = 120$ ✓

(ii) $x^2 - 7x - 120 = 0$

$(x-15)(x+8) = 0$

$\boxed{x = 15}$ $x = -8$ ✗

Can't be negative.

Part 2: Geometry

1. $(7-2) \times 180$

$= 900°$

2. $\frac{360}{18} = 20$ sides

3. $\angle ABC = \angle BGE$ (alt $\angle$'s on $\parallel$ lines)

$\angle BGE = \angle DEF$ (alt $\angle$'s on $\parallel$ lines)

$\therefore \angle ABC = \angle DEF$

4. $\angle DAB = \angle DBA = x°$ (DA = DB Base $\angle$'s in isosceles $\triangle$'s equal).

$\angle DBC = \angle DCB = y°$ (BD = DC Base $\angle$'s in isosceles $\triangle$'s equal).

$2y + 2x = 180$

$x + y = 90$

$\angle ABC = x + y$

$\angle ABC = 90°$ as required

5 (i) AB = BD (given)

$\angle ABC = \angle BDE$ (corr $\angle$'s on $\parallel$ lines)

BC = DE (given)

$\triangle ABC \equiv \triangle BDE$ (SAS)

(ii) $\angle ACB = \angle BED$ (matching $\angle$'s in congruent $\triangle$'s)

$\angle ACB$ and $\angle BED$ are corresponding $\angle$s. AC $\parallel$ BE

$\frac{a}{b^3} = \frac{10}{x}$

$\frac{20^3}{150^3} = \frac{10}{x}$

$x = \frac{33750000}{8000}$

$x = 4218.75 cm^2$

Part 3: Graphs

1. Graph 1: $y = -\frac{1}{x}$

Graph 2: $x^2 + y^2 = 16$

Graph 3: $y = x^2 + 1$

Graph 4: $y = 3^x$

2. (a) $y = x^3 - 3$

(b) $y = -x^3$

(c) $y = (x+4)^3$

$\therefore x^2 + y^2 - 4y + 4 = 8 + 4$

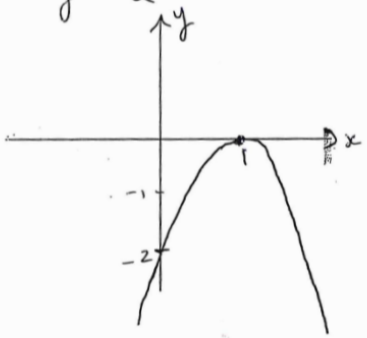
$x^2 + (y-2)^2 = 12$

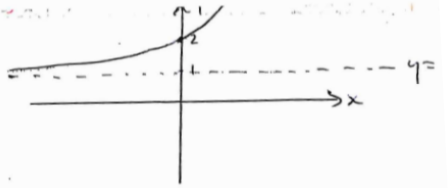
Centre (0, 2) $R = \sqrt{12}$ OR $2\sqrt{3}$

1. y-int: $x = 0$

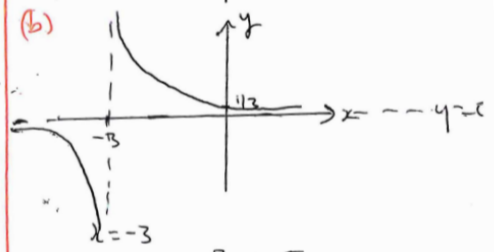
$y = -2(0-1)^4$

$y = -2$





(b)



6. $y = -ax^3 + 5$

(1, 3)

$3 = -a(1)^3 + 5$

$3 = -a + 5$

$-2 = -a$

$a = 2$

$\therefore y = -2x^3 + 5$.

7.