Name: _____

Teacher: _____

Year 10 5.3 Mathematics

Assessment Task 4

22nd September 2006

Weighting: 40%

Time allowed: 2 hours
(Plus 5 minutes reading time)

Instructions to Students	Total marks – 103 marks
• Answer the questions in the space provided. • Show all necessary working out. • Marks may be deducted for careless or untidy setting out • Write using a black or blue pen.	**Part A** Total marks (20) Attempt Questions 1-20 Allow no more than 20 minutes for this part **Part B** Total marks (83) Attempt questions 1-10

PART A

Circle the letter A, B, C or D that best answers the question.
Allow no more than 20 minutes for this part of the paper.

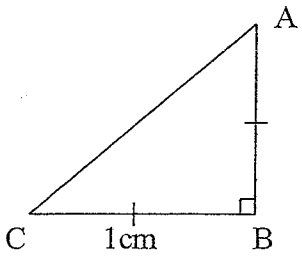
1. $\frac{1}{2}$ % as a decimal is:

A. 0.005 **B.** 0.05 **C.** 0.5 **D.** 50

2. Simplify: $a^3 + a^3 + a^3$

A. $3a^3$ **B.** $3a^9$ **C.** a^9 **D.** a^{27}

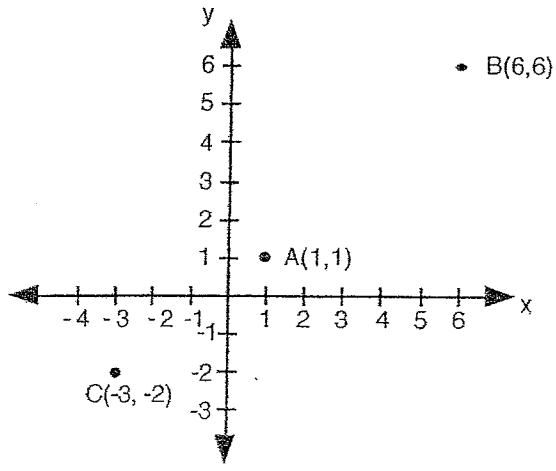
3. The exact length of AC is:



A. 1 **B.** 2

C. $\sqrt{2}$ **D.** $\sqrt{3}$

4. Which point/s is/are 5 units from the point A(1,1)?



A. B only

B. C Only

C. Both B and C

D. Neither B or C

5. Sue is x years old. Tanya is 6 years older than Sue. Rosa is 3 years older than Tanya. The total of the ages of Sue, Tanya and Rosa is 45 years.

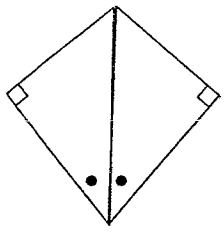
Which equation represents this information?

A. $x+9=45$ C. $3x+9=45$

B. $x+15=45$ D. $3x+15=45$

6. Which test could you use to prove the following triangles are congruent?

[DIAGRAM NOT TO SCALE]



A. SSS

B. SAS

C. AAS

D. RHS

7. Kieran swam 1500 metres in 20 minutes. His average speed in km/hour is:

A. 0.45 B. 0.75 C. 4.5 D. 7.5

8. A local nursery sells bags of 'Green My Lawn' in four different sizes.

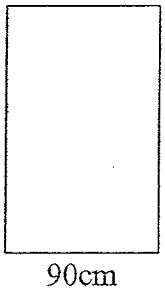
Which is the best buy?

A. 750g for $1.60 C. 3kg for $6.25

B. 1kg for $2.10 D. 5kg for $10.25

9. A window is 2 metres high and 90 centimetres wide. Find, in square metres, the area of glass in the window.

[DIAGRAM NOT TO SCALE]



A. $0.18m^2$

B. $1.8m^2$

C. $18m^2$

D. $180m^2$

10. The cost (C) in dollars of a mobile telephone monthly account is given by the formula:

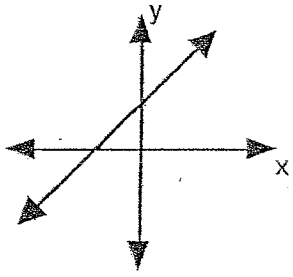
$C = 0.55 \times N + 15$, where N is the number of phone calls in a month.

The cost of 30 mobile phone calls in a month is:

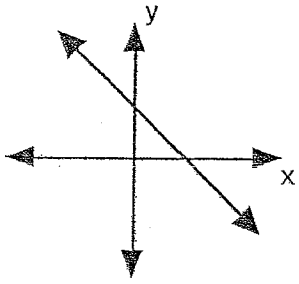
A. \$16.50 **B.** \$24.75 **C.** \$31.50 **D.** \$45.55

11. Which of the following could be the line $y = x + 2$?

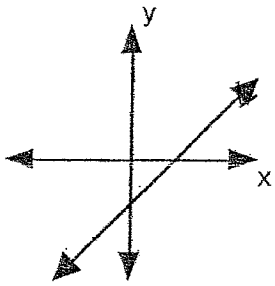
A.



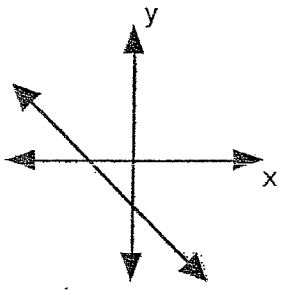
B.



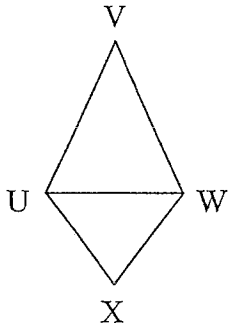
C.



D.



12. In the diagram, ΔUVW is an isosceles triangle and ΔUWX is an equilateral triangle.



What shape best describes UVWX?

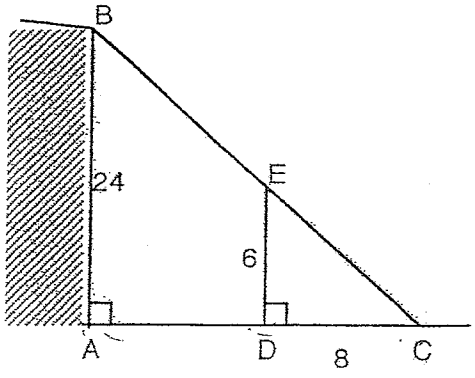
A. trapezium

B. rhombus

C. parallelogram

D. kite

13. In the diagram, ΔABC is similar to ΔDEC.



If AB = 24, DE = 6 and DC = 8, the value of AD is:

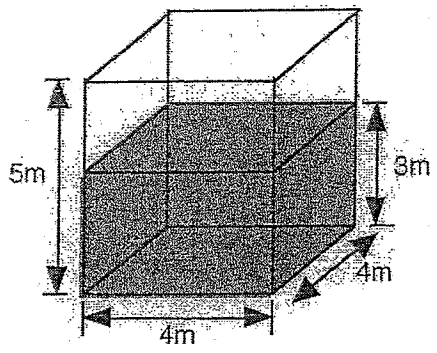
A. 4

B. 6

C. 24

D. 32

14. This large tank contains oil. How much more oil is needed to fill the tank?



A. $32m^3$ **B.** $48m^3$ **C.** $60m^3$ **D.** $80m^3$

15. A recent weekly wage sheet for Eric is shown below:

NAME	HOURLY RATE	NORMAL HOURS	TIME-AND-A-HALF	DOUBLE TIME
Eric King	?	30	6	4

Eric earns $470 for the week shown in the above wage sheet. His hourly rate is closest to:

A. $10.00 **B.** $10.75 **C.** $11.00 **D.** $11.75

16. If $a = -5$, find the value of $3a^2$.

A. –75 **B.** 75 **C.** –225 **D.** 225

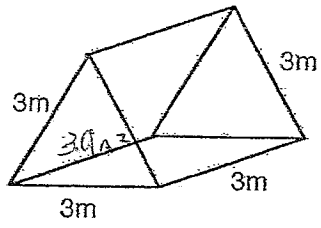
17. Due to the GST, the price of a computer fell by 10% and now sells for $3600.

How much, in dollars, has the computer price fallen?

A. $360 **B.** $400 **C.** $3240 **D.** $4000

18. Each triangular face of this prism has an area of $3.9m^2$.

The total surface area of the prism is:



A. $12.9m^2$

B. $25.8m^2$

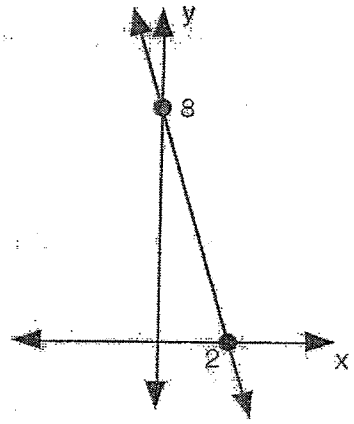
C. $30.9m^2$

D. $34.8m^2$

19. Solve: $2m-9=17$

A. $m=4$ **B.** $m=6$ **C.** $m=11$ **D.** $m=13$

20. The gradient of the straight line given is:



A. -4

B. 4

C. $-\frac{1}{4}$

D. $\frac{1}{4}$

PART B

Question 1 (6 marks)

a. Factorise the following expressions. **[2]**

i) $x^2+16x+64$ ii) $81-x^2$

b. What number needs to be added to x^2-12x to make the expression a perfect square? **[1]**

c. Simplify the following expression: **[3]**

$$\frac{1}{4x-12}-\frac{2}{x^2+2x-15}$$

Question 2 (10 marks)

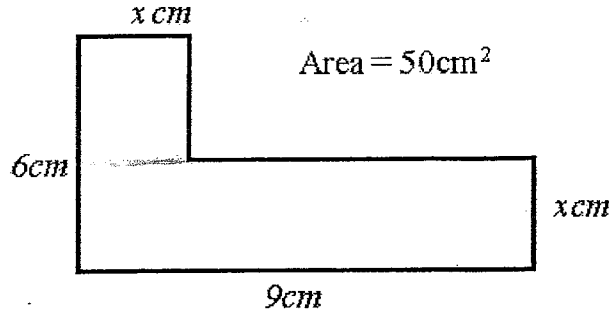
a. Solve the following equations: [5]

i) $x^2 - 13x - 48 = 0$

ii) $3x^2 - 13x - 30 = 0$

b. Solve the equation $2x^2 - 7x + 4 = 0$ using the quadratic formula. Give your answer correct to 2 decimal places. [2]

c. Find the value of x in the following shape: [3]



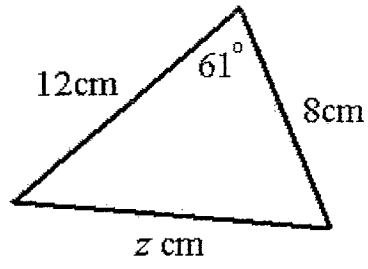
d. Rearrange to make v the subject of the equation $E = \frac{1}{2}mv^2$. [2]

Question 3 (12 marks)

a. Find the exact value of $\cos 45^\circ$. [1]

b. Find all possible values of θ if $0 < \theta < 180^\circ$ and $\sin\theta = 0.5942$. Give θ to the nearest minute. [2]

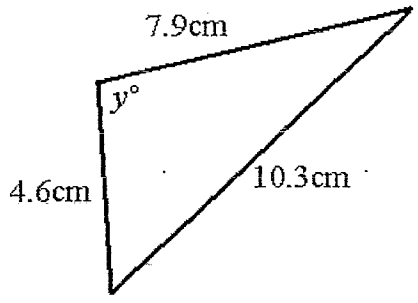
c. Consider the following triangle. *(Diagram not drawn to scale)* [4]



i) What is the area of the triangle, correct to 1 decimal place?

ii) What is the value of z, correct to 1 decimal place?

d. Find the value of y to the nearest minute. *(Diagram not drawn to scale)* **[2]**



e. Town B is 20 km due East of Town A. The bearing of Town C is 035° from Town A and 295° from Town B. **[3]**

i) Draw a diagram showing the information provided.

ii) Find the distance from A to C. Give answer correct to 1 decimal place.

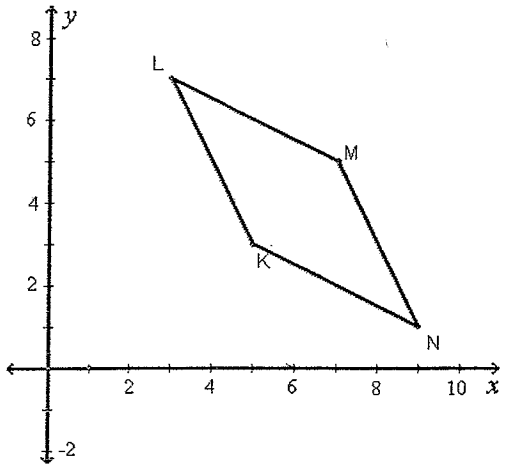
Question 4 (6 marks)

a. Find the equation of the line perpendicular to the line $y=\frac{x}{3}+4=0$ and passing through the point (3,-4). Give your answer in general form. **[3]**

b. On a number plane, shade the region where $y>4x+7$ **[3]**

Question 5 (7 marks)

a. The quadrilateral K(5,3), L(3,7), M(7,5), N(9,1) has been graphed. Show that the diagonals KM and LN bisect each other, by finding the coordinates of the midpoint of KM and LN. (If two lines bisect each other then the midpoint of one line is the midpoint of the other.) **[2]**



b. For the parabola $y = x^2 + 10x + 21$ **[5]**

i) Find the y-intercept

ii) Find the x-intercepts

iii) Find the turning point

iv) Sketch the parabola

Question 6 (8 marks)

a. The graph of $y=-6(x-2)^3+4$ is obtained from the graph of $y=x^3$ by undertaking what transformations? **[1]**

A) translate 2 units left, reflect about the x-axis, enlarge by a factor of 6 translate 4 units up.
B) reflect about the line $x=2$, reflect about the x-axis, enlarge by a factor of 6, translate 4 units up.
C) translate 2 units right, reflect about the x-axis, enlarge by a factor of 6, translate 4 units up.
D) translate 6 units left, translate 4 units up, reflect about the line $x=2$.

Answer: _____

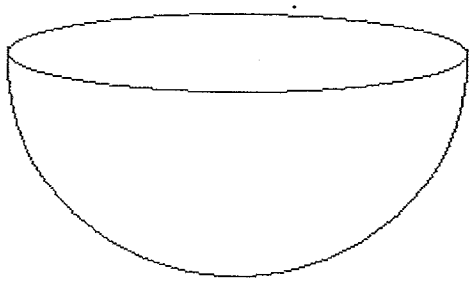
b. Give the co-ordinates of the centre of the following circle $x^2+y^2-12y+20=0$ and state its radius. **[3]**

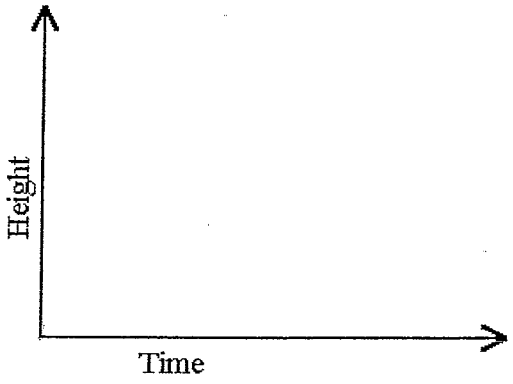
c. Use algebraic methods to find the points of intersection of the curves $y=x^2-x-10$ and $y=x+5$. **[4]**

Question 7 (4 marks)

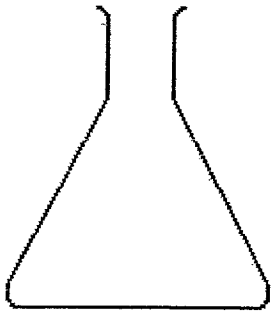
a. Water is poured into the following containers at a steady rate. For each container draw a graph to show how the height, *h*, of the water in the container changes over the time, *t*, it takes to fill each container.

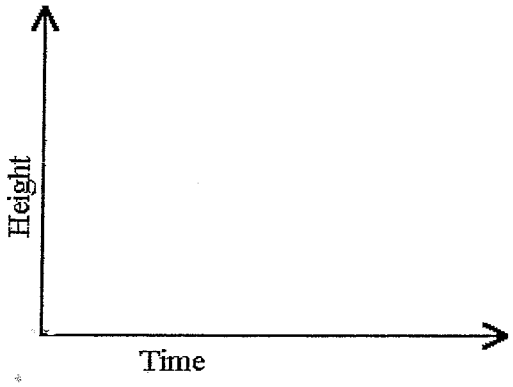
i) **[2]**



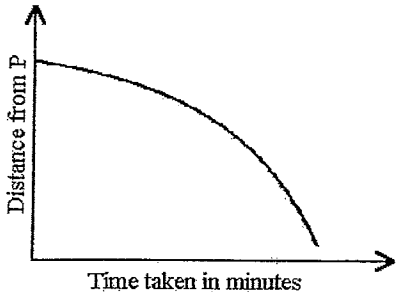


ii)





b. The following graph shows the distance from a location P traveled by a moving object. Describe the motion of the object. **[2]**



Question 8 (15 marks)

a. Give an example of a monic polynomial of degree 5 with four terms **[1]**

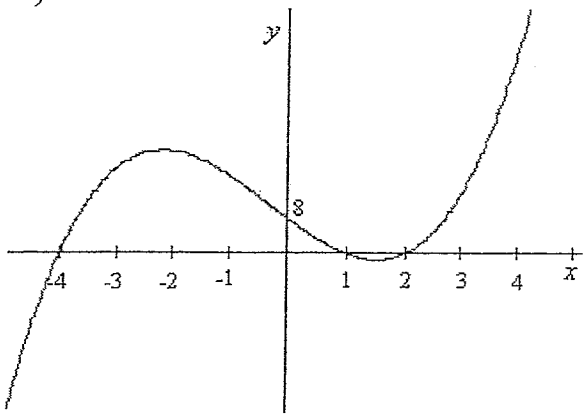
b. If $P(x) = 4x^5 - x^3 + 7x$ and $Q(x) = 2x^5 - x^4 - 3x$ write the simplified expression for $P(x) - 2Q(x)$ **[2]**

c. Use the remainder theorem to find the remainder when $2x^3 - 5x^2 - 7x + 2$ is divided by $(x+3)$ **[2]**

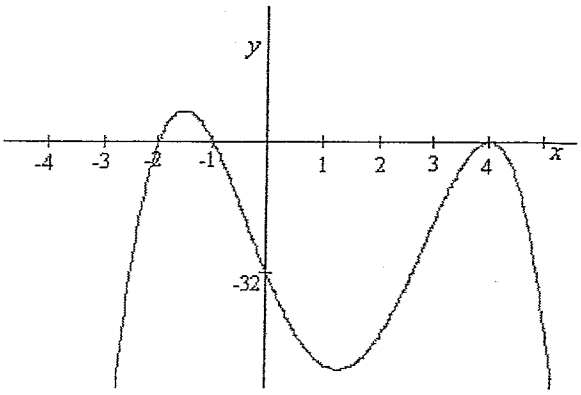
d. Use the factor theorem to factorise $R(x) = x^3 - x^2 - 10x - 8$ into linear factors. **[4]**

e. The graph of the polynomial function: $P(x) = -(x-4)^2(x+2)(x+1)$ is: **[1]**

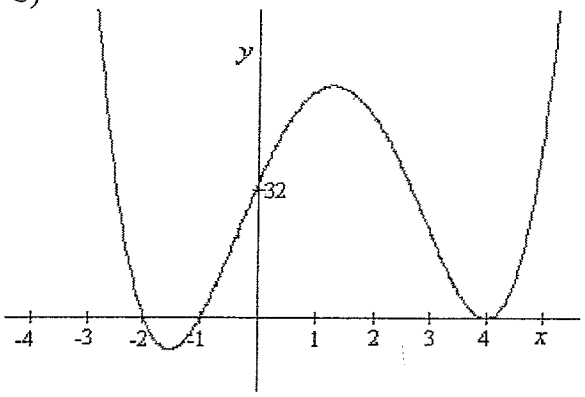
A)



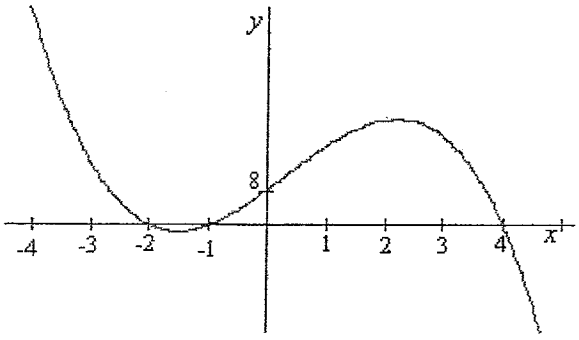
B)



C)



D)

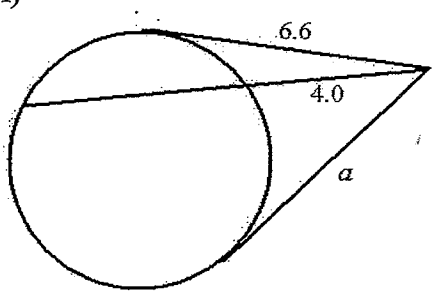


Answer:

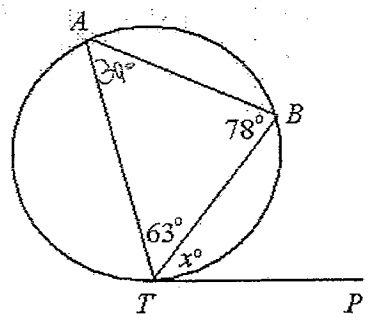
Question 9 (8 marks)

a. Find the value of the pronumerals in the diagrams, **giving reasons**. Give lengths correct to 1 decimal place and angles to the nearest degree. **[2]**

i)

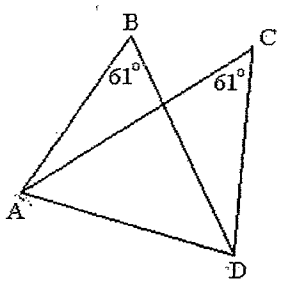


ii)



b. Determine if the points A, B, C and D in each diagram are concyclic. **You must give reasons for your answers.** **[4]**

i)



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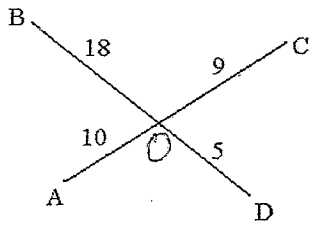
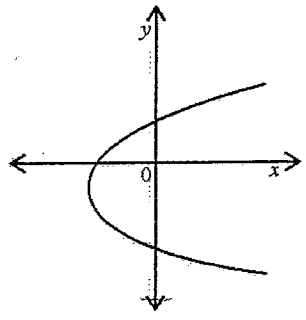


Question 10 (12 marks)

a. Circle the graph(s) which are not functions. **[1]**

i)



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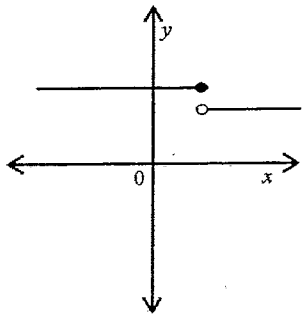
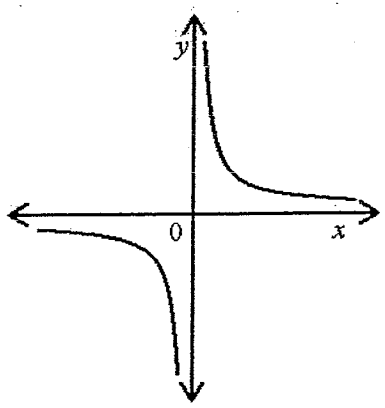
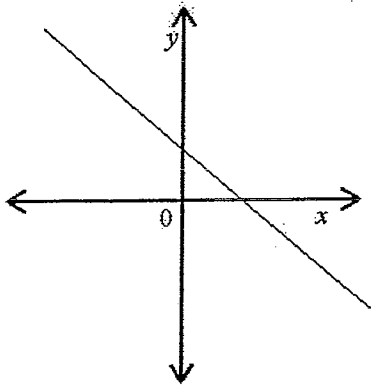


iii)



iv)



b. Find the inverse function of the function $f(x) = 3x - 5$: **[2]**

c. The inverse of a function can be found graphically by reflecting the original function in the line : **[1]**

d. Write the following in log form: **[2]**

i) $5^3 = 125$

ii) $8^{\frac{2}{3}} = 4$

e. Evaluate: [3]

i) $\log_2 128$

ii) $\log_5 18 - \log_5 9 - \log_5 10$

f. Solve: [3]

i) $\log_{10} x = 3$

ii) $\log_4 x = -2$

END OF EXAM

Name: SOLUTIONS

Teacher:

Year 10 5.3 Mathematics

Assessment Task 4

22nd September 2006

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(Plus 5 minutes reading time)

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PART A

15/20

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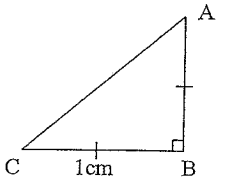
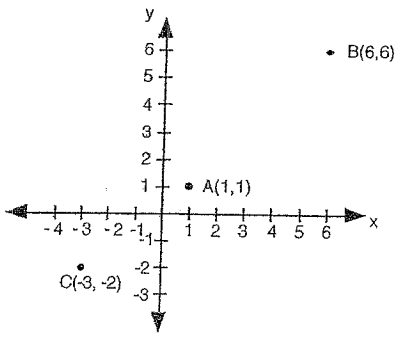


A. 1 **B.** 2

(C.) $\sqrt{2}$ (D.) $\sqrt{3}$

4. Which point/s is/are 5 units from the point A(1,1)?



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(D.) Neither B or C

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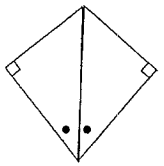
B. $x+15=45$ D. $3x+15=45$

6. Which test could you use to prove the following triangles are congruent?

[DIAGRAM NOT TO SCALE]



A. SSS

B. SAS

C. AAS

D. RHS

7. Kieran swam 1500 metres in 20 minutes. His average speed in km/hour is:

A. 0.45 B. 0.75 C. 4.5 D. 7.5

8. A local nursery sells bags of 'Green My Lawn' in four different sizes.

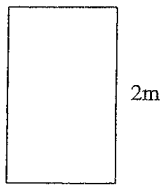
Which is the best buy?

A. 750g for $1.60 C. 3kg for $6.25

B. 1kg for $2.10 D. 5kg for $10.25

9. A window is 2 metres high and 90 centimetres wide. Find, in square metres, the area of glass in the window.

[DIAGRAM NOT TO SCALE]



A. $0.18m^2$

B. $1.8m^2$

C. $18m^2$

D. $180m^2$

10. The cost (C) in dollars of a mobile telephone monthly account is given by the formula:

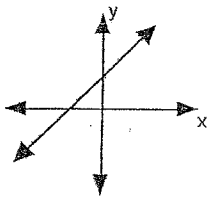
$C = 0.55 \times N + 15$, where N is the number of phone calls in a month.

The cost of 30 mobile phone calls in a month is:

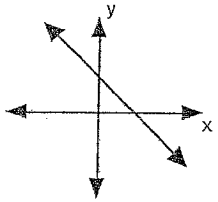
A. $16.50 B. $24.75 C. $31.50 D. $45.55

11. Which of the following could be the line $y = x+2$?

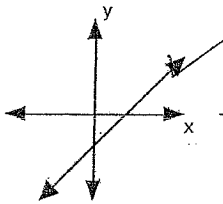
A.



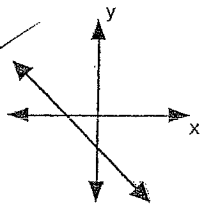
B.



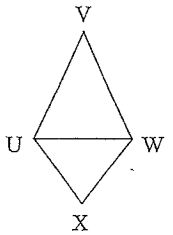
C.



D.



12. In the diagram, ΔUVW is an isosceles triangle and ΔUWX is an equilateral triangle.



What shape best describes UVWX?

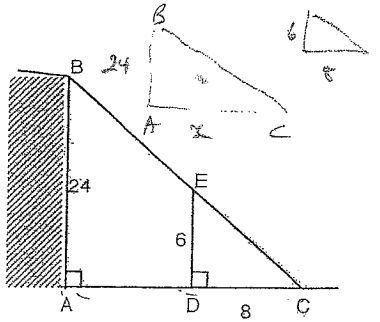
A. trapezium

B. rhombus

C. parallelogram

D. kite

13. In the diagram, ΔABC is similar to ΔDEC.



If AB = 24, DE = 6 and DC = 8, the value of AD is:

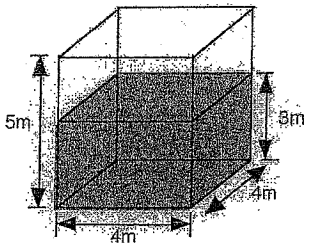
A. 4

B. 6

C. 24

D. 32

14. This large tank contains oil. How much more oil is needed to fill the tank?



(A.) $32m^3$ **B.** $48m^3$ **C.** $60m^3$ **D.** $80m^3$

15. A recent weekly wage sheet for Eric is shown below:

NAME	HOURLY RATE	NORMAL HOURS	TIME-AND-A-HALF	DOUBLE TIME
Eric King	?	30	6	4

Eric earns $470 for the week shown in the above wage sheet. His hourly rate is closest to:

(A.) $10.00 **B.** $10.75 **C.** $11.00 **D.** $11.75

16. If $a=-5$, find the value of $3a^2$.

A. -75 (B.) 75 **C.** -225 **D.** 225

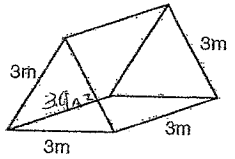
17. Due to the GST, the price of a computer fell by 10% and now sells for $3600.

How much, in dollars, has the computer price fallen?

(A.) $360 (B.) $400 **C.** $3240 (D.) $4000

18. Each triangular face of this prism has an area of $3.9m^2$.

The total surface area of the prism is:



A. $12.9m^2$

B. $25.8m^2$

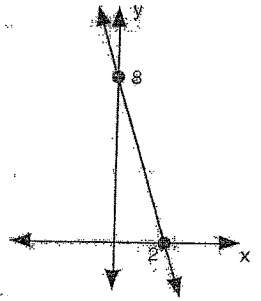
C. $30.9m^2$

(D.) $34.8m^2$

19. Solve: $2m-9=17$

(A.) $m=4$ **B.** $m=6$ **C.** $m=11$ (D.) $m=13$

20. The gradient of the straight line given is:



(A.) -4

B. 4

C. $-\frac{1}{4}$

D. $\frac{1}{4}$

PART B

Question 1 (6 marks) 3½

a. Factorise the following expressions. [2]

i) $x^2+16x+64$

$=(x+8)(x+8)$ ✓

ii) $81-x^2$ $= 9^2-x^2$

$=(9+x)(9-x)$

$(9-x)^2$ ✗

b. What number needs to be added to x^2-12x to make the expression a perfect square? [1]

$+36$

$x^2-12x+36$ ✓

c. Simplify the following expression: [3]

$$\frac{1}{4x-12}-\frac{2}{x^2+2x-15} = \frac{1}{4(x-3)}-\frac{2}{(x+5)(x-3)} = \frac{x+5-8}{4(x-3)(x+5)}$$

$$\frac{1}{4(x-3)}-\frac{2}{(x-3)(x+2)(x+5)} = \frac{x-3}{4(x-3)(x+5)}$$

$$= \frac{1}{4(x+5)}$$

$\frac{x+2-8}{4(x-3)(x+2)}$ 1 C.F. error.

↖ could cancel $(x+2)$.

$= -\frac{2}{x-3}$ ✗

Question 2 (10 marks) 5½/11

a. Solve the following equations:

i) $x^2-13x-48=0$

$(x-16)(x+3)=0$

$x=16$ or $x=-3$ ✓2

ii) $3x^2-13x-30=0$

$S=-13$

$P=3\times-30$

3×-10

$3\times3\times10$

$=3.3.2.5$

$=18\times5$

$(3x^2+2x)(-15x-30)$

$x(3x+2)-15($

$(3x^2-15x)(2x-30)=0$

$3x(x-5)+2(x-15)=0$

$(x-5)(x-15)(3x+2)=0$

$x=5$ or $x=15$ or $x=-\frac{2}{3}$ ✗

$(3x+5)(x-6)=0$

$x=-\frac{5}{3}$ or 6

4 0.

b. Solve the equation $2x^2-7x+4=0$ using the quadratic formula. Give your answer correct to 2 decimal places. [2]

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

$=\frac{--7\pm\sqrt{-7^2-4\times2\times4}}{2\times2}$

$=\frac{7\pm\sqrt{49-32}}{4}$

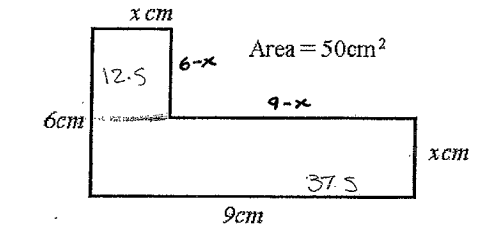
$=\frac{7\pm\sqrt{17}}{4}$

$x=2.78$ ✓

or

$x=0.72$ ✓ 2

c. Find the value of x in the following shape: [3]



$9\times6-(6-x)(9-x)=50$

$54-50=54-15x+x^2$

$\therefore x^2-15x+50=0$

$(x-10)(x-5)=0$

$x=10$ (Not valid) or $x=5$ only

$A=L\times b+L\times b$

$50=9x+\frac{1}{2}\times6\times x$

$50=9x+3x$

$50=12x$

$x=\frac{50}{12}$ 0.

d. Rearrange to make v the subject of the equation $E = \frac{1}{2}mv^2$. [2]

$v^2 = \frac{E}{\frac{1}{2}m}$

$v = \pm\sqrt{\frac{E}{\frac{1}{2}m}}$ $\frac{1}{2}$

$\therefore v = \pm\sqrt{\frac{2E}{m}}$

Question 3 (12 marks)

a. Find the exact value of $\cos 45°$. [1]

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

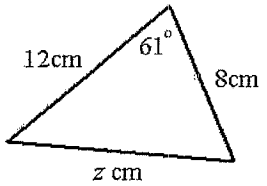
b. Find all possible values of θ if $0 < \theta < 180°$ and $\sin\theta = 0.5942$. Give θ to the nearest minute. [2]

$\sin\theta = 0.5942$ 1

$\theta = 36°27'$

obtuse angle

c. Consider the following triangle. *(Diagram not drawn to scale)* [4]



i) What is the area of the triangle, correct to 1 decimal place?

$A = \frac{1}{2}ab\sin C$

$= \frac{1}{2} \times 12 \times 8 \times \sin 61$ 2

$= 42.0\text{cm}^2$

ii) What is the value of z, correct to 1 decimal place?

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

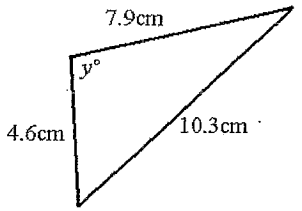
$z^2 = 12^2 + 8^2 - 2 \times 12 \times 8 \times \cos 61$

$z^2 = 114.91655\ldots$

$z = 10.7\text{cm}$ 2

10/12

d. Find the value of y to the nearest minute. *(Diagram not drawn to scale)* [2]



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

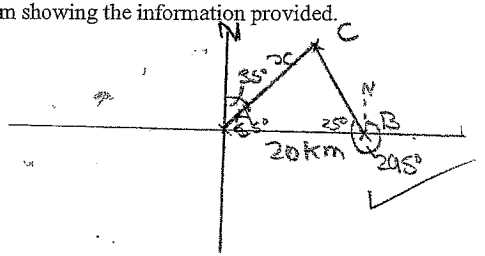
$\cos y = \frac{7.9^2 + 4.6^2 - 10.3^2}{2 \times 7.9 \times 4.6}$

$\cos y = -0.30985\ldots$ 2

$y = 108°03'$

e. Town B is 20 km due East of Town A. The bearing of Town C is 035° from Town A and 295° from Town B. [3]

i) Draw a diagram showing the information provided.



3

ii) Find the distance from A to C. Give answer correct to 1 decimal place.

let $AC = x$

$\angle CAB = 90° - 35°$ (given)

$= 55°$

$\angle CBA = 90° - 65°$ (given)

$= 25°$

$\therefore \angle ACB = 180 - 25 - 55$

$= 100°$

$\frac{x}{\sin 25°} = \frac{20}{\sin 100°}$

$x = \frac{20}{\sin 100°} \times \sin 25°$

$x = 8.6\text{km}$

3

Question 4 (6 marks)

a. Find the equation of the line perpendicular to the line $y=\frac{x}{3}+4=0$ and passing through the point (3,-4). Give your answer in general form. 0 [3]

$y-y_1=m(x-x_1)$

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

$y+4=3-\frac{9}{2}$ ✗

$\frac{9}{2}$

$\frac{9}{2}+y+1=0$ ✓

$m=-3$

Equation is

$y+4=-3(x-3)$

$y+4=-3x+9$

$\therefore 3x+y-5=0$

b. On a number plane, shade the region where $y>4x+7$ 3 [3]

let $y=4x+7$

when $y=0$

$x=-\frac{7}{4}$

when $x=0$

$y=7$

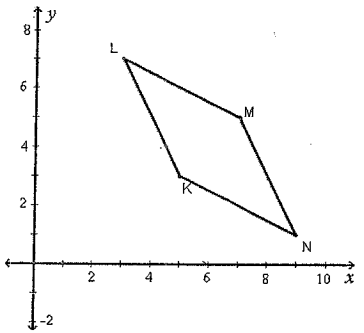
line is dotted

$-\frac{7}{4}$ ✓

6½

Question 5 (7 marks)

a. The quadrilateral K(5,3), L(3,7), M(7,5), N(9,1) has been graphed. Show that the diagonals KM and LN bisect each other, by finding the coordinates of the midpoint of KM and LN. (If two lines bisect each other then the midpoint of one line is the midpoint of the other.) 2 [2]



$M_{KM}=\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$M_{KM}=\left(\frac{5+7}{2}, \frac{3+5}{2}\right)$

$=(6,4)$ ✓

$M_{LN}=\left(\frac{3+9}{2}, \frac{7+1}{2}\right)$

$=(6,4)$ ✓

∴ KM & LN bisect eachother as they have the same midpoint ✓

b. For the parabola $y = x^2 + 10x + 21$ [5]

i) Find the y-intercept

$y = 21$ ✓

ii) Find the x-intercepts

$(x+7)(x+3) = 0$

$x = -7$ or $x = -3$ ✓

iii) Find the turning point

$\frac{-b}{2a} = \frac{-10}{2\times 1}$

$= -5$

Sub -5 into eqn

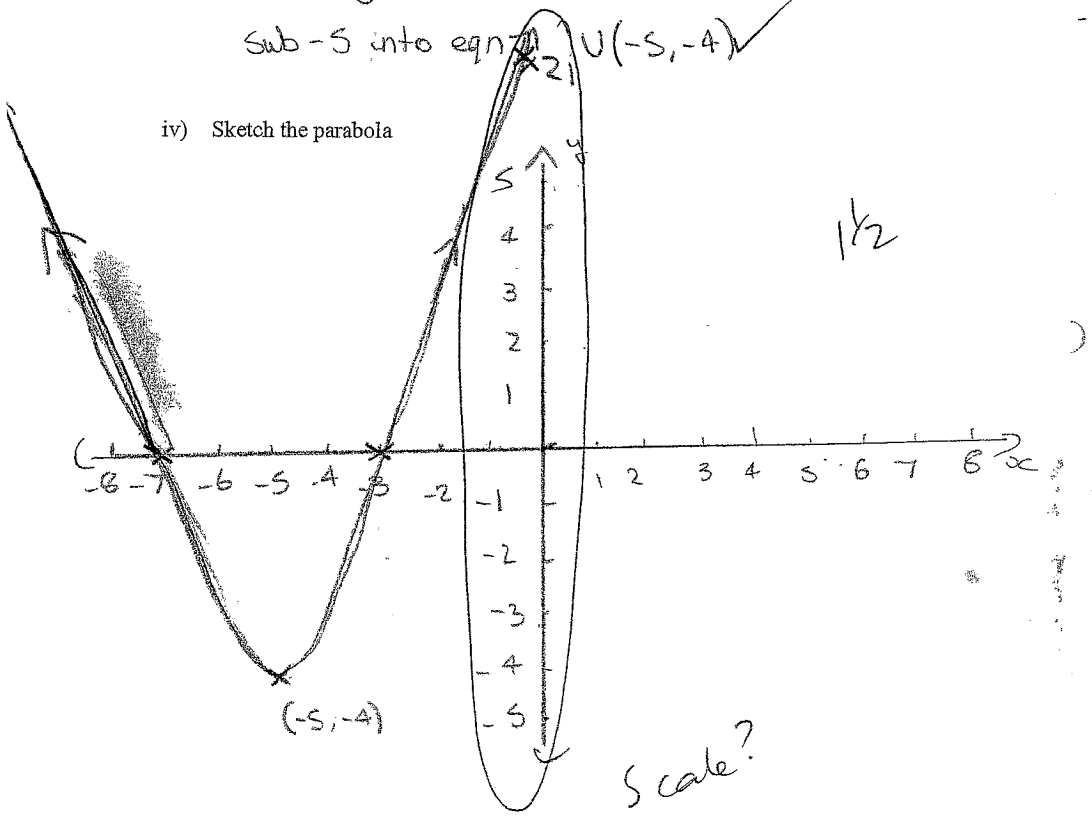
$y = (-5)^2 + 10(-5) + 21$

$= 25 - 50 + 21$

$= -4$

$(-5, -4)$ ✓

iv) Sketch the parabola



scale?

Question 6 (8 marks)

a. The graph of $y = -6(x-2)^3 + 4$ is obtained from the graph of $y = x^3$ by undertaking what transformations? [1]

A) translate 2 units left, reflect about the x-axis, enlarge by a factor of 6 translate 4 units up.

B) reflect about the line $x = 2$, reflect about the x-axis, enlarge by a factor of 6, translate 4 units up.

C) translate 2 units right, reflect about the x-axis, enlarge by a factor of 6, translate 4 units up.

D) translate 6 units left, translate 4 units up, reflect about the line $x = 2$.

Answer: C ✓ 1

b. Give the co-ordinates of the centre of the following circle $x^2 + y^2 - 12y + 20 = 0$ and state its radius. [3]

$x^2 + y^2 - 12y + 20 = 0$

$(x-h)^2 + (y-k)^2 = r^2$

$x^2 + y^2 - 12y(-6)^2 = 20$

$x^2 + (y+6)^2 = 56$

$C = (0, -6)$

$r = 7.48$ exact value

c. Use algebraic methods to find the points of intersection of the curves $y = x^2 - x - 10$ and $y = x + 5$. [4]

$y = x^2 - x - 10$

$y = x + 5$

$x^2 - x - 10 = x + 5$

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

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

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

$x = \pm\sqrt{5}$

Sub back in

$y = \sqrt{5} + 5$

$y = 7.24$ (2dp)

points = $(\sqrt{5}, 7.24)$

$y = 5 + 5$

$y = 10$ and

$y = -3 + 5$

$= 2$

∴ point of intersect are $(5, 10)$ and $(-3, 2)$

$x = 3.70$ (2dp) or

$x = -2.70$ (2dp)

$y = 3.7 + 5$

$y = 8.7$ or

$y = -2.7 + 5$

$y = 2.3$

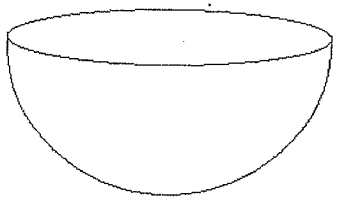
∴ $(3.70, 8.7)$ & $(-2.7, 2.3)$ are the points of intersect

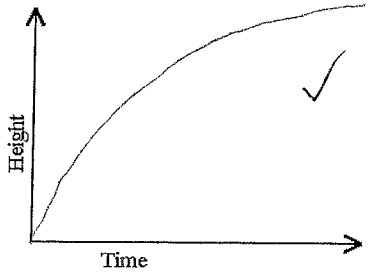
4

Question 7 (4 marks)

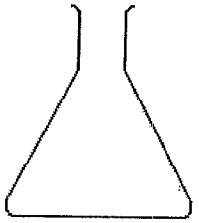
a. Water is poured into the following containers at a steady rate. For each container draw a graph to show how the height, h, of the water in the container changes over the time, t, it takes to fill each container. [2]

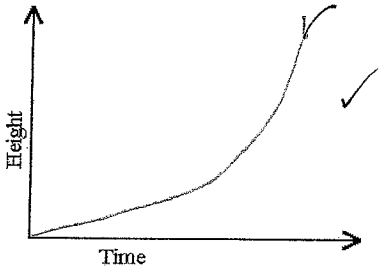
i)



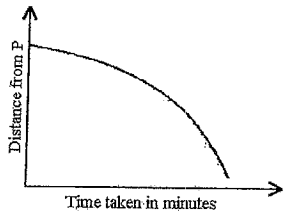


ii)





b. The following graph shows the distance from a location P traveled by a moving object. [2]
Describe the motion of the object.



The moving object is coming back ~~at a steady rate~~ to P and ~~possib~~ speeding up as it gets closer

8 + 2 / 10

Question 8 (~~15~~ marks)

a. Give an example of a monic polynomial of degree 5 with four terms [1]

~~$x^5 + 2x^3 + 5$~~

~~$x^5 + 2x^3 + 5$~~

$x^5 + x^3 + x^2 + x$ ✓ 1

b. If $P(x) = 4x^5 - x^3 + 7x$ and $Q(x) = 2x^5 - x^4 - 3x$ write the simplified expression for $P(x) - 2Q(x)$ [2]

$4x^5 - x^3 + 7x - 2(2x^5 - x^4 - 3x)$

$4x^5 - x^3 + 7x - 4x^5 + 2x^4 + 6x$

$= 2x^4 - x^3 + 13x$ ✓ 2

c. Use the remainder theorem to find the remainder when $2x^3 - 5x^2 - 7x + 2$ is divided by $(x+3)$ [2]

$P(-3) = 2(-3)^3 - 5(-3)^2 + 7(-3) + 2$

$= -54 - 45 + 21 + 2$

$= 32$ ✗

1/2

Let $P(x) = 2x^3 - 5x^2 - 7x + 2$

$= 2(-3)^3 - 5(-3)^2 - 7(-3)$

$= -54 - 45 + 21 + 2$

$= -76$

d. Use the factor theorem to factorise $R(x) = x^3 - x^2 - 10x - 8$ into linear factors. [4]

$P(-1) = -1 - 1 + 10 - 8$

$= 0$

$$x+1 \overline{)\, x^3 - x^2 - 10x - 8}$$

$x^2 - 2x - 8$

$x^3 + x^2$

$-2x^2 - 10x$

$-2x^2 - 2x$

$-8x - 8$

$-8x - 8$

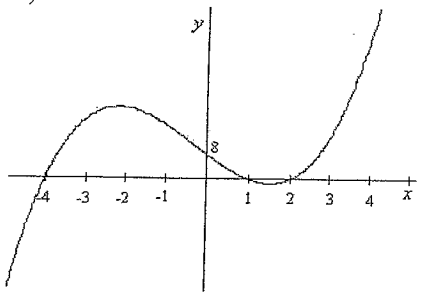
0

$\therefore (x+1)(x^2 - 2x - 8)$

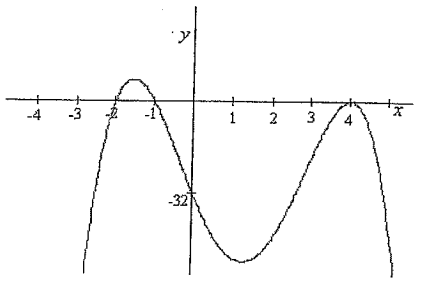
$= (x+1)(x-4)(x+2)$ ✓ 4

e. The graph of the polynomial function: $P(x) = -(x-4)^2(x+2)(x+1)$ is: [1]

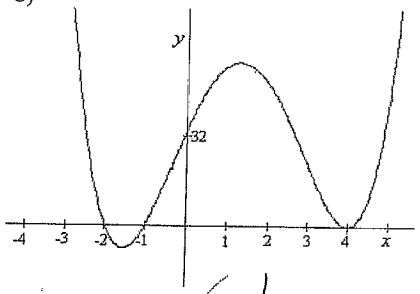
A)



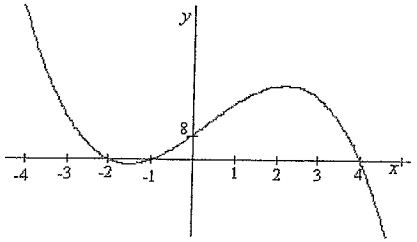
B)



C)



D)

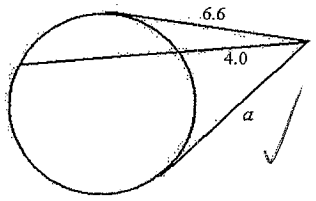


Answer: B ✓ 1

Question 9 (8 marks) 6/8

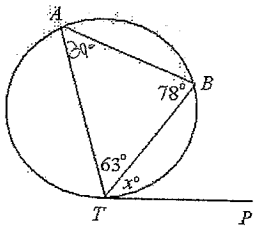
a. Find the value of the pronumerals in the diagrams, **giving reasons**. Give lengths correct to 1 decimal place and angles to the nearest degree. 2 [2]

i)



$a = 6.6$ (tangents from same circle ~~are equal in length~~ that meet at same point are equal) ✓

ii)

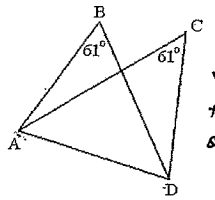


$\angle BAT = 180 - 63 - 78$ ($\angle$ sum of $\triangle$) = $39°$ ✓ 2 [2]

$x = 39°$ ($\angle$ b/w tangent and chord is equal to opp. $\angle$)

b. Determine if the points A, B, C and D in each diagram are concyclic. **You must give reasons for your answers.** 2 [4]

i)

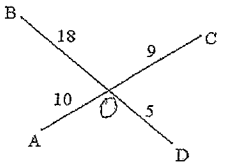


Yes, angles in the same segment standing on (arc) AD. (chord)

No ✗

more than 4 points not sure.

ii)



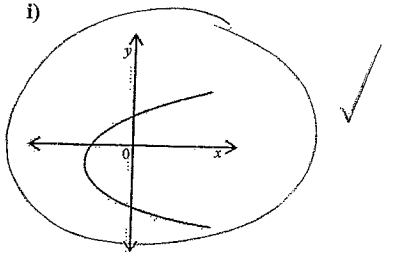
~~Yes~~ Yes ✓

$18 \times 5 = 10 \times 9$ ($AO \times CO = BO \times DO$)

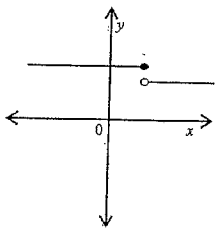
Question 10 (12 marks) 11/12

a. Circle the graph(s) which are not functions. 1 [1]

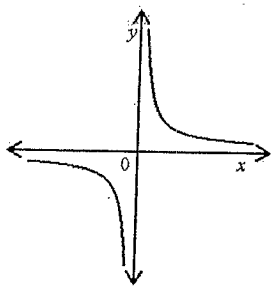
i)



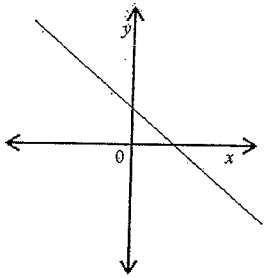
ii)



iii)



iv)



b. Find the inverse function of the function $f(x)=3x-5$: 2 [2]

~~$f(x)^{-1}$~~ = let $y=3x-5$ ✓

$x=3y-5$

$3y=x+5$

$y=\frac{x+5}{3}$

$\therefore f(x)^{-1}=\frac{x+5}{3}$ ✓

c. The inverse of a function can be found graphically by reflecting the original function in the line : $y=x$ ✓ 1 [1]

d. Write the following in log form: 2 [2]

i) $5^3=125$

$\log_5 125=3$ ✓

ii) $8^{\frac{2}{3}}=4$

$\log_8 4=\frac{2}{3}$ ✓

e. Evaluate: 2 [3]

i) $\log_2 128$

$\frac{\log_{10}128}{\log_{10}2}$

$=7$ ✓

ii) $\log_5 18-\log_5 9-\log_5 10$

$\frac{\log_5 18}{\log_5 9}-\log_5 10$

$=\frac{18}{9}-\log_5 10$

$=\frac{2}{10}=\log_5 \frac{1}{5}$

$=0.2 \quad =-1$

f. Solve: 3 [3]

i) $\log_{10} x=3$

$x=10^3$

$x=1000$ ✓

ii) $\log_4 x=-2$

$x=4^{-2}$ ✓

$x=0.0625$ ✓

END OF EXAM