Question 1 **[Maximum mark: 10]** ***[Start on a new green sheet]***

(a) Evaluate $\sqrt{\dfrac{\pi^2+3.2^3}{5.6-1.2^2}}$ correct to **three** significant figures. **2**

(b) Simplify $\dfrac{x}{x^2-4}+\dfrac{2}{x-2}$ **2**

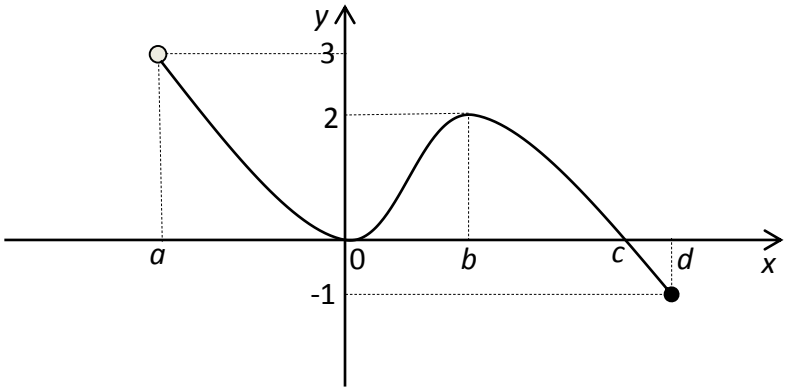
(c) Find integers a and b such that $\dfrac{1}{\sqrt{5}-2}=a+b\sqrt{5}$ **2**

(d) Show that $f(x)=x^4+3x^2-1$ is an even function. **2**

(e) Solve the inequality $x^2-x-12<0$ **2**

Question 2 **[Maximum mark: 10]** ***[Start on a new green sheet]***

(a) The diagram shows a sketch of the curve $y = g(x)$ **3**



(i) Write down the range of $g(x)$.

(ii) For what values of x is $g(x)$

- Increasing
- Decreasing

(b) Shade the region in the Cartesian plane for which the following inequalities hold simultaneously.

$y < x - 2, \quad y \geq 0 \ \ and \ \ x \geq 6$ **3**

(c) Simplify : $\dfrac{6^m + 2^m}{2^m}$ **2**

(d) Solve $9^{x-3} = 3$ **2**

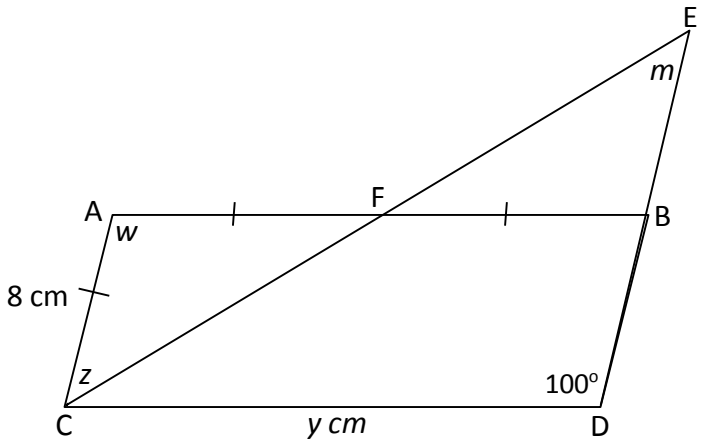
Question 3 [Maximum mark : 10] ***[Start on a new green sheet]***

(a) Evaluate the following limits:

(i) $\lim\limits_{x\to 2} \dfrac{2x+3}{x-1}$ **1**

(ii) $\lim\limits_{x\to 1} \dfrac{x^3-1}{x-1}$ **2**

(b) ABCD is a parallelogram. Find the values of m, w, y and z. **4**



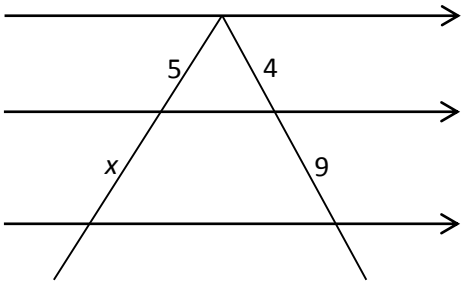
(c) Sketch the following graphs and state their domain.

(i) $y = \sqrt{16-x^2}$ **1**

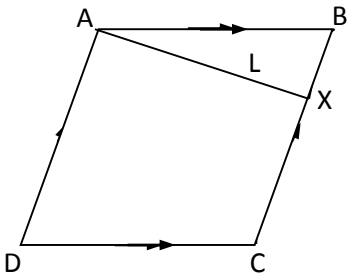
(ii) $y = \dfrac{3}{x-2}$, $-3 \le y \le -1$ **2**

Question 4 **[Maximum mark: 10]** ***[Start on a new green sheet]***

(a) Find the value of x. **2**



(b) $ABCD$ is a rhombus, AX is perpendicular to BC and intersects BD at L.



Not to scale

(i) Copy the diagram into your Answer sheet and explain why

$$\angle ADB = \angle CDB.$$ **2**

(ii) Prove that ΔALD and ΔCLD are congruent. **3**

(iii) Show that $\angle DAL$ is a right angle. **2**

(iv) Hence or otherwise find the size of $\angle LCD$ **1**

End of Examination

REDLANDS
LET YOUR LIGHT SHINE

✓ = $\frac{1}{2}$ mark
✓ = 1 mark

Student Number:.....

QUESTION 1.

(a) 3.20 ✓ (2) [3.20147218...]

(b) $\frac{x}{x^2-4} + \frac{2}{x-2}$

$\frac{x + 2(x+2)}{(x+2)(x-2)}$ ✓

$= \frac{x+2x+4}{(x+2)(x-2)}$ ✓

$= \frac{3x+4}{(x+2)(x-2)}$ ✓ (2)

(c) $\frac{1}{\sqrt{5}-2} \times \frac{\sqrt{5}+2}{\sqrt{5}+2}$ ✓

$= \frac{\sqrt{5}+2}{(\sqrt{5})^2-2^2} = \frac{\sqrt{5}+2}{5-4}$

$= \sqrt{5}+2.$ ✓

$\therefore q = 2.$ ✓ (2)

$b = 1.$ ✓

(d) $f(x) = x^4+3x^2-1.$

$f(-x) = (-x)^4+3(-x)^2-1$ ✓

$= x^4+3x-1$ ✓

$= f(x)$ ✓

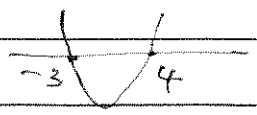
(2)

$\therefore f(x)$ is even.

(e) $x^2-x-12 < 0$

$(x-4)(x+3)$ ✓

$x = 4, -3$



✓

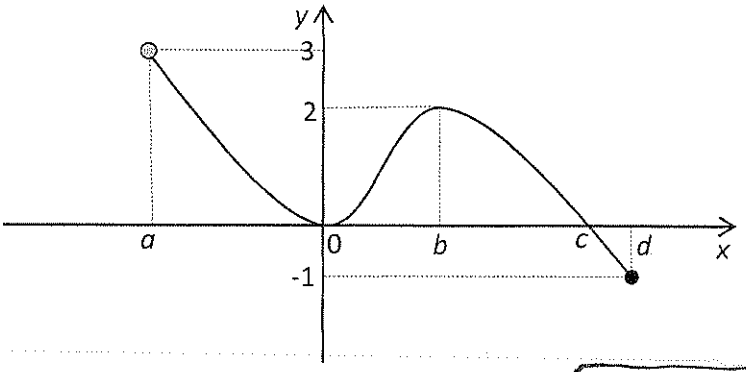
$\therefore -3 < x < 4.$ ✓

(2)

EXCELLENT

Question 2 **[Maximum mark: 10]** ***[Start on a new green sheet]***

(a) The diagram shows a sketch of the curve $y = g(x)$ 3



½ mark in total taken for ≤ instead of <

(i) Write down the range of $g(x)$. $\{y: -1 \leq y < 3, y \in R\}$

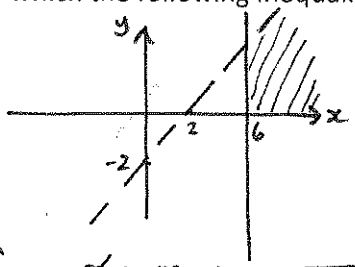
(ii) For what values of x is $g(x)$

- Increasing
- Decreasing

$0 < x < b$
$a < x < 0, \quad b < x < d$

(b) Shade the region in the Cartesian plane for which the following inequalities hold simultaneously.

$y < x - 2, \quad y \geq 0 \text{ and } x \geq 6$



- Diagram should be ⅓ to ½ page.
- Ruler should be used
- At least one number should be used on each axis to show scale.

2

(c) Simplify : $\frac{6^m + 2^m}{2^m}$ Reduce to primes

$= \frac{3^m 2^m + 2^m}{2^m} = \frac{2^m(3^m + 1)}{2^m} = 3^m + 1$

(d) Solve $9^{x-3} = 3$

$3^{2(x-3)} = 3^1$ ✓½

$\therefore \quad 2(x-3) = 1$ ✓

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

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

$x = 3\frac{1}{2}$ or $\frac{7}{2}$ ✓

OR

$9^{x-3} = 9^{\frac{1}{2}}$

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

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

OR

$\log_9 9 = x - 3$

$0.5 = x - 3$

$3.5 = x$

2

OR

$\log_{10} 9^{x-3} = \log_{10} 3$

$(x-3)\log_{10} 9 = \log_{10} 3$

$x - 3 = \frac{\log_{10} 3}{\log_{10} 9}$

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

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

EDLANDS
LET YOUR LIGHT SHINE

✓ = ½ mark
✓ = 1 mark

Student Number:.....

QUESTION 3.

(a) (i)

$$\lim_{x \to 2} \frac{2x+3}{x-1}$$

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

$$= \underline{7} \quad ✓ \quad (1)$$

(ii) $$\lim_{x \to 1} \frac{x^3-1}{x-1}$$

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

$$= \lim_{x \to 1} x^2+x+1$$

$$= 1^2+1+1 \quad ✓$$

$$= \underline{3} \quad ✓ \quad (2)$$

(b) $M = 40°$ ✓

$w = 100°$ ✓

$y = 16\text{cm}$ ✓

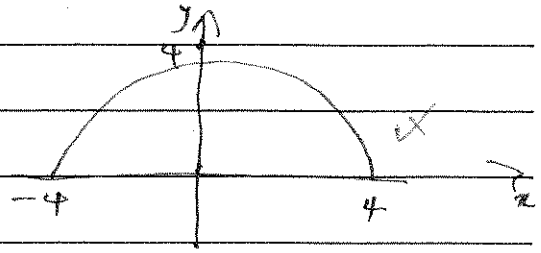
$z = 40°$ ✓

(4)

(c) (i)

$$y = \sqrt{16-x^2}$$

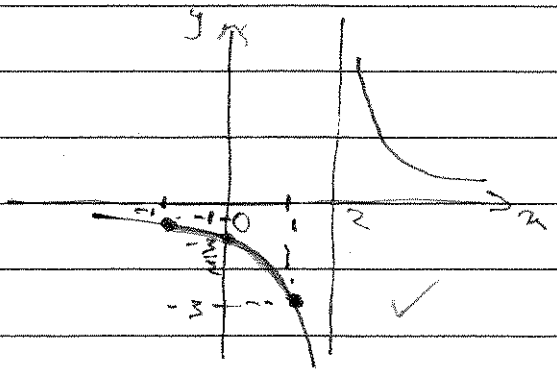
$$= \sqrt{4^2-x^2}.$$



✓ ✓

Domain: $-4 \leq x \leq 4$. ✓ (1)

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



✓

$-3 = \frac{3}{x-2}$	$-1 = \frac{3}{x-2}$
$-3(x-2) = 3$	$-1(x-2) = 3$
$-3x+6 = 3$	$-x+2 = 3$
$-3x = -3$	$-x = 1$
$x = 1.$	$x = -1.$

Domain: $-1 \leq x \leq 1$. ✓

(2)

EDLANDS
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✗ = ½ mark
✓ = 1 mark

Student Number:.....

QUESTION 4.

(a) $\frac{x}{5} = \frac{9}{4}$ ✗

$4x = 45$ ✗

$x = \frac{45}{4} = 11\frac{1}{4}$. ✓ (2)

(b) (i) The diagonals of a rhombus bisect the angles of a rhombus. (2)

1 mark for the diagram
1 mark for the reason.

(ii) In ΔALD and ΔCLD

DL is common ✗

✗ AD = DC sides of a rhombus ✗

$\angle ADL = \angle CDL$ (i) above. ✗

$\therefore \Delta ALD \equiv \Delta CLD$ (SAS) ✓ (3)

(iii) $\angle DAL = 90°$ (Alt. angles on // lines). ✓ (2)

(iv) $\angle LCD = 90°$ corresponding angles of congruent Δ. ✓ (1)