

(3 marks)

Q3

$$(x+2)(x+3)(x-1) = 0$$

$$\begin{array}{r} x = -2 \\ x = -3 \\ x = 1 \end{array}$$

$$\frac{(x+2)(x+3)(x-1)}{(x+2)(x+3)} = 0$$

$$x-1 = 0$$

$$x = 1$$

(3 marks)

Q4

$$(a) x^3 + 4x^2 + x - 6 = 0$$

$$t = x$$

$$t^3 + 4t^2 + t - 6 = 0$$

$$t^3 - 2t^2 + 6t^2 + 4t + t - 6 = 0$$

$$t(t^2 - 2t + 6) + t(6t + 1) - 6 = 0$$

$$t(t-2)^2 + t(6t+1) - 6 = 0$$

$$t(t-2)^2 = 6 - t(6t+1)$$

$$t(t-2)^2 = 6 - 6t^2 - t$$

$$t(t-2)^2 + 6t^2 + t - 6 = 0$$

$$t(t^2 - 4t + 4 + 6t^2 + 1) - 6 = 0$$

$$t(7t^2 - 4t + 5) - 6 = 0$$

$$t = 0$$

$$t = 1$$

$$x = 0$$

$$x = 1$$

(3 marks)

Q5

$$(b) (x-2)^2 - 1 = x + 3$$

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

$$x-2 = \pm \sqrt{x+4}$$

$$x = 2 \pm \sqrt{x+4}$$

$$x = 2 + \sqrt{x+4}$$

$$x = 2 - \sqrt{x+4}$$

Q6

Q7

$$(a) x^2 + 24x - 25 = 0$$

$$x = 1$$

$$x = -25$$

$$(x+25)(x-1) = 0$$

$$x = 1$$

$$x = -25$$

(2 marks)

Solve the following equations for x .

Attempt all questions.

Question 1

Name of student: ... (Name) ...
Total marks available: 35

Time Allowed: (5+25) minutes

Section One (Calculator Free)

Question 2

M(3, 4) is the midpoint of point R(-1, 5) and point S.

(a) Determine the coordinates of point S.

(5 marks)

(2 marks)

$$\left\{ \begin{array}{l} \frac{-1 + x}{2} = 3 \\ -1 + x = 6 \end{array} \right.$$

$$x = 7$$

$$\frac{5 + y}{2} = 4$$

$$5 + y = 8$$

$$y = 3$$

$(7, 3)$ ✓

(b) Determine the equation of the straight line that passes through point (2, -1) and is perpendicular to the line through points R and M.

(3 marks)

M(3, 4) R(-1, 5) S(7, 3)

$$3 - 5 = m(7 - 1)$$

$$y = mx + c$$

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

$$y = m(x - 1) + c$$

$$y = m(x - 1) + c$$

$$y = m - 4$$

$$m = \frac{1}{-4}$$

$$y = \frac{1}{-4}x + c$$

$$-1 = \frac{1}{-4}(2) + c$$

$$y = mx + c$$

$$\cancel{y}$$

$$-1 = \frac{1}{-4}(2) + c$$

$$-1 = 8 + c$$

$$-1 - 8 = c$$

$$-9 = c$$

$$y = \frac{1}{-4}x - 9$$

$$\frac{1}{-0.25} = 4$$

$$y = mx + c$$

$$-1 = 4(2) + c$$

$$-1 = 8 + c$$

$$-1 - 8 = c$$

$$-9 = c$$

$$\boxed{y = 4x - 9}$$

Answer

2

2

$$\begin{aligned} & y = 4x - 9 \\ & -1 = 4(2) + c \\ & -1 = 8 + c \\ & -1 - 8 = c \\ & -9 = c \end{aligned}$$

4

①

②

(b) $G(x) = \sqrt{x - 4}$

(a) $F(x) = 5 + x^2$

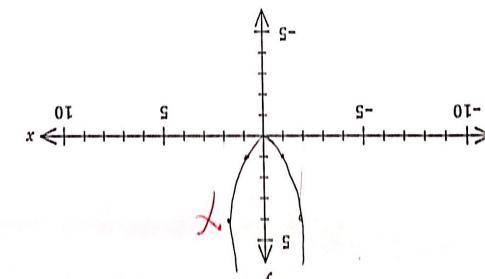
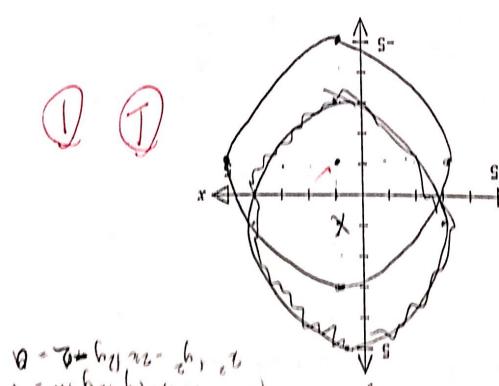
State the domain and corresponding range for the following functions.

Question 4

(4 marks)

Question 3

3

The vertical line $x = 150$
 ~~$y^2 = x$~~ is a function of x because $y^2 = x$ passes(c) Explain whether y is a function of x in the relationship graphed in (b). (2 marks)(b) Sketch the graph of $y^2 = x$ on the axes below. (2 marks)(a) Sketch the graph of $(x-1)^2 + (y+1)^2 = 4$ on the axes below. (3 marks)

(7 marks)

Question 3

Question 5

(4 marks)

Consider the line $2x + by = c$ where c is a constant.(a) Find b if the line has gradient -4.

$$\begin{aligned} 2x + by &= c \\ by &= -2x + c \\ y &= \frac{-2x}{b} + \frac{c}{b} \end{aligned}$$

(2 marks)

gradient: $\frac{-2}{b} = -4$

$$\begin{aligned} -2 &= b \\ -4 &= b \\ b &= 0.6 \end{aligned}$$

(b) Find the c if this line has an X-intercept of 6.

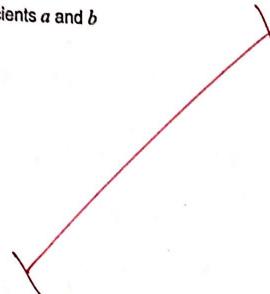
(2 marks)

$$\begin{aligned} y &= 0.5x + c \\ 0 &= 0.5(6) + c \\ 0 &= 3 + c \\ -3 &= c \end{aligned}$$

Y

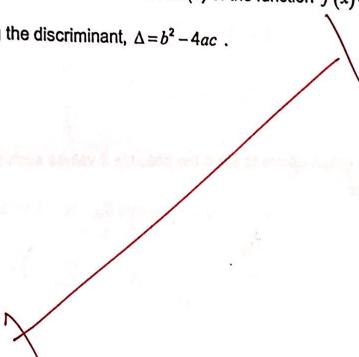
(i) Express the cubic in the form $x^3 - 3x^2 - 3x + 14 = (x+2)(x^2 + ax + b)$ evaluating the coefficients a and b

(2 marks)



(ii) Hence, state the number of real root(s) of the function $f(x) = x^3 - 3x^2 - 3x + 14$. Justify your answer using the discriminant, $\Delta = b^2 - 4ac$.

(4 marks)

**End of Section Two**

6

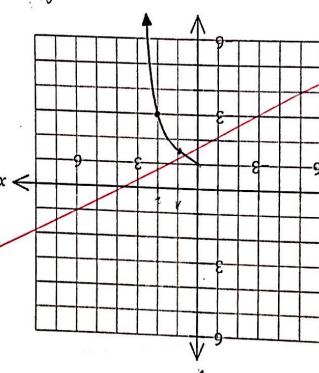
End of section one

(3 marks)

$$\textcircled{1} \quad a = 3x - 1$$

$$-3 = \frac{a}{2-3}$$

$$y = \frac{ax}{2-3}$$



(1 mark)

Section Two (Calculator Assumed)

Time Allowed: (5 + 55) minutes

marks

Student's Name: ... Chuu... Anh.Dung 11A

Total Mark available. 51

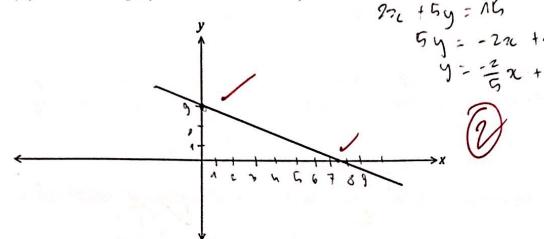
35

Question 7 (6 marks)

The variables x and y are related by the equation $2x + 5y = 15$.

(a) Sketch the graph of this relationship.

(2 marks)



(b) Express y in terms of x and briefly explain why y is a function of x . (2 marks)

$$y = -\frac{2}{5}x + 3 \quad \text{①}$$

because it passes the vertical line test,

there are no repeated x \checkmark ①

(c) The domain of x is restricted to $5 \leq x < 10$. State the range of y . (2 marks)

range: $y \mid y > -1 \quad y \leq 1$

②

$$\begin{aligned} 2x + 5y &= 15 \\ 10 + 5y &= 15 \\ 5y &= 5 \\ y &= 1 \end{aligned}$$

$$\begin{aligned} 2x(10) + 5y &= 15 \\ 20 + 5y &= 15 \\ 5y &= -5 \\ y &= -1 \end{aligned}$$

$$2x(10) + 5y = 15$$

$$20 + 5y = 15$$

$$5y = -5$$

$$y = -1$$

Question 12 (6 marks)

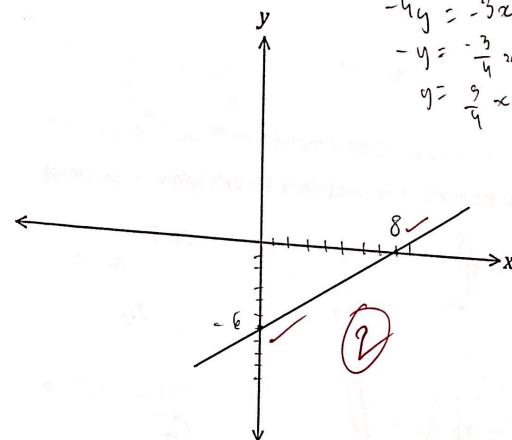
Line L_1 has equation $3x - 4y = 24$.

(a) Sketch the graph of L_1 .

$$\begin{aligned} -4y &= -3x + 24 \\ y &= \frac{3}{4}x - 6 \end{aligned}$$

$y_{int} = -6$
 $x_{int} = 8$

$$y = mx + c$$



(b) Determine the equation of the line L_2 that is parallel to L_1 and passes through the point with coordinates $(-2, -3)$. (2 marks)

$$y = \frac{3}{4}x - 6 \quad \text{①}$$

$$y = \frac{3}{4}x - c$$

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

$$-3 = -1.5 - c$$

$$-3 = -1.5 - c$$

$$\begin{aligned} -1.5 &= c \\ c &= -1.5 \quad \text{①} \end{aligned}$$

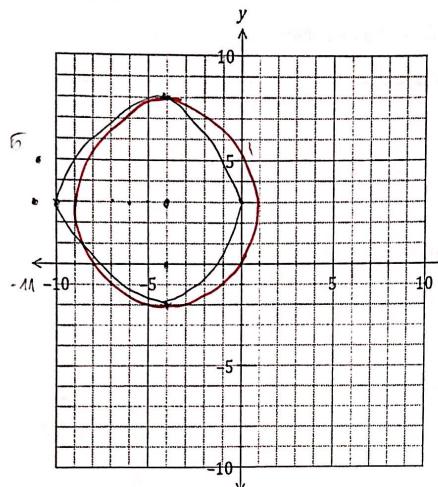
$$y = \frac{3}{4}x - 1.5 \quad \text{①}$$

(c) Determine the equation of the line L_3 that is perpendicular to L_1 and has the same y intercept as L_1 . (2 marks)

$$\begin{aligned} y_{int} &= -6 \\ m &= -\frac{4}{3} \quad \text{①} \\ -6 &= -\frac{4}{3}(0) + c \\ -6 &= c \\ y &= -\frac{4}{3}x - 6 \quad \text{①} \end{aligned}$$

Question 9

- (a) The variables x and y are related by $(x + 4)^2 + (y - 3)^2 = 25$.
 (i) Sketch the graph of this relationship.



(6 marks)

(3 marks)

①

- (ii) How does the vertical line test indicate that y is not a function of x ? (1 mark)

The vertical line test infers the graph two times,
 so it is not a function ①

- (b) The graph of $(x + 4)^2 + (y - 3)^2 = 25$ that you made in (a) is moved left 7 units and up 2 units.
 What will be the equation of the graph in its new location? (2 marks)

$$(x + 11)^2 + (y - 5)^2 = 25$$

①

3

Question 10

(6 marks)

The graph $y = f(x)$, where $f(x) = x^2 + bx + c$ has a turning point at $(-2, -1)$.

- (a) State the equation of the line of symmetry for the graph of $y = f(x)$. (1 mark)

$$x = -2$$

①

- (b) Determine the value of the constant b and the value of the constant c . (3 marks)

$$y = x^2 + bx + c$$

$$-1 = 4 + b(-2) + c$$

$$-1 = 4 - 2b + c$$

+4

use turning point form

$$y = a(x - b)^2 + c$$

$$y = (x + 2)^2 - 1 \quad \text{①}$$

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

$$y = x^2 + 4x + 3$$

$$\boxed{b = 4} \quad \boxed{c = 3}$$

- (c) The graph of $y = f(x)$ is translated 3 units to the right and 5 units upwards. Determine the equation of the resulting curve. (2 marks)

turning point
 $(1, 4)$

$$y = (x - 1)^2 + 4$$

②

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

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

4